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THE AMERICAN REVIEW OF TUBERCULOSIS

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THE NATIONAL ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS

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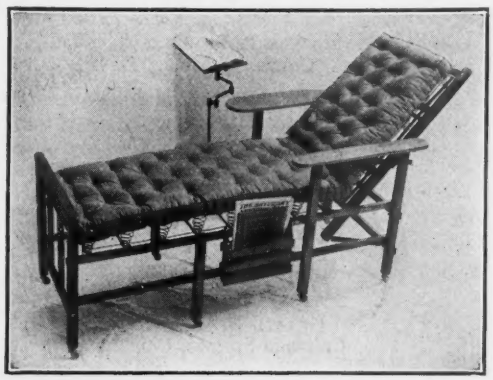

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ELEMENTARY CONCEPTS OF TUBERCULOSIS

A CLINICAL LECTURE[1]

ALLEN K. KRAUSE

From the Kenneth Dows Fund for the Study of Tuberculosis, of the Medical Clinic of the Johns Hopkins Hospital, Baltimore, Maryland

As you observed the children and heard their histories in the last two clinics it must have occurred to you that the manifestations of tuberculous infection in children are wonderfully varied and diversified. They may be obscure, they may be outspoken, or they may be altogether suppressed. They may be focal, they may be widespread, they may be constitutional. As a rule the outspoken or type case offers few difficulties of diagnosis. The obscure case however may present extraordinary obstacles and call for your rarest skill and judgment. In almost every obscure case of illness in childhood you must learn to know what are and what are not the clinical evidences of tuberculous infection and tuberculous disease. Often this evidence may be equivocal and it may therefore be necessary for you to fall back on the past history of the patient and a knowledge of his surroundings from birth to arrive at a probable diagnosis.

Therefore pay unusual attention to the patient's history. It is not enough to learn that the patient's mother or father or any other relative died of tuberculosis. Find out when in relation to the patient's life the relative had tuberculosis and in how intimate contact they were. Do not be content with the information that no relative had tuberculosis. Adroit questioning will often bring out the evidence of chronic cough or haemorrhage or chronic malnutrition or wasting disease in some one who has been in association with the patient: and all these are common manifestations of possible tuberculosis.

If you grant that the term "Disease" should be used only to signify manifest or clinical illness then you must have already noted that an individual can have tuberculous infection without however having tuberculous disease. A number of these little patients were perfectly

[1] Delivered to third year students in course.

well when you saw them. They were strong and vigorous and healthy. Yet they were and are now and perhaps always will be infected; that is, they have anatomic tubercle. If they absorb enough from this anatomic tubercle they become ill and show clinical tuberculosis. If the investment of this anatomic tubercle is so competent that little or no absorption takes place they remain well. Practically all of these patients once had clinical tuberculosis, but most of them have succeeded in walling in the offending tubercle so as to render it harmless—for the time being, at least. Tubercle and the bacilli in the interior of the tubercle remain, but the symptoms have disappeared. Some of the patients had only one symptomatic period: others had many. None of us can predict with certainty who will and who will not have another attack. But we can pretty certainly affirm that every one of them will carry tubercle and perhaps tubercle bacilli to his dying day—even though he live to extreme old age. A tuberculosis cure is a cure of symptoms and an arrest of the tuberculous process. It is probably never a complete obliteration of the offending lesions, nor a complete sterilization of the infected tissues.

We can also predict with certainty that relatively few of these children will die of tuberculosis in childhood. Most of them will probably go into adolescence free even from clinical tuberculosis. What will happen then is another story which will not be told here. But some of them will undoubtedly live out a long life and never again hear from their infection.

It is of the utmost importance that you get this situation firmly fixed in your mind. Without this conception you cannot possibly understand or explain very much that you will encounter in your growing acquaintance with tuberculosis. With it you can begin to attack the problem.

Now let us go back a step farther. Besides thousands of children who would present histories similar to those that you have already heard, there are millions in whom you cannot detect a single sign or symptom of tuberculous disease. In other words, they are not and never have been clinically tuberculous. But suppose you test their skin with tuberculin,—what then? Why, they will react. In other words they have tuberculous infection. Somewhere in their bodies is anatomic tubercle —microscopic perhaps in many of them—but nevertheless anatomic: englobing, surrounding and walling off living tubercle bacilli. You are now dealing with infection without disease and the numbers of children (and adults) who are thus circumstanced are legion. European statis-

tics would make this condition on the continent an almost universal penalty of community life in individuals above the age of twelve years. The difference between these children and our clinic children so far as anatomic change goes is a quantitative one. Like our clinic children, many of these clinically non-tuberculous, though infected, children will become clinically tuberculous, some soon, some five years from now, some not until thirty, forty or fifty years hence. But most of them will never have a symptom of tuberculosis, notwithstanding the fact that they will carry anatomic tubercle and perhaps living bacilli to their graves.

In our present state of civilization tubercle bacilli are ubiquitous and children are ubiquitous; the tubercle bacillus is an infecting and invading microörganism for human beings, and so far as we know the human being is just as susceptible to infection by the tubercle bacillus as by the virus of measles. (But mark the word infection.) In a variety of ways the bacillus gains entrance to our bodies. In a variety of ways and in any one or many of a great many possible places it comes to rest. Here it lodges or focalizes and perhaps more or less multiplies. It is an irritant of a parasitic nature and the cells among which it lodges treat it as such. They react to the irritation. They proliferate and form tubercle, the sole purpose of which is to wall off this invader. In the great majority of us over one year of age this initial reaction suffices. The tubercle wall is proof against the mechanical effects of intercurrent disease, of physical strain, of trauma and of abnormal habits. We remain healthy. We test ourselves with tuberculin and react positively. We then say that we have tuberculous infection.

But some of us do not get the same lucky deal. We may get measles at the wrong time—perhaps shortly after the focus is formed, before a competent investment has taken place. We may fall ill with pneumonia. We may have acute or chronic inflammation of the throat and neighboring glands. We may weaken the defensive wall by local stress due to physical strain.

The net result is the same. If the proper proportions of vigorous assault and weak defence are reached there is a strong probability that our defensive tubercle wall will be broken through. The living microörganisms inside can then slip out. They may get to the blood and go to the lungs or bones and joints, or meninges, or a variety of places. They may get to the lymph stream and set up new foci at other more or less remote places. They may spread by way of a bronchus. They

may move only a very short distance and settle just outside the original capsule. Their numbers are now probably larger than at the moment of infection and they produce a correspondingly greater reaction. Symptoms develop and their expression is what, in the presence of adequate or characteristic signs, we call tuberculous disease or clinical tuberculosis.

To sum up:

1. In community life the opportunity for infection is omnipresent.
2. The susceptibility of the human being to infection is great.
3. The tendency to infection is inevitable or obligate.
4. The tendency to disease is accidental or facultative.
5. In the light of our present knowledge we feel that tubercle (benign) is in many instances converted into tuberculosis—in other words, benign anatomic tubercle becomes clinical tuberculosis.
6. This conversion is effected mainly by
   a. Intercurrent disease—common colds, measles, pneumonia, diabetes, etc.
   b. Physical overstrain.
   c. Trauma.
   d. Abnomal habits of living.
   e. What may be called physical overstrain—pregnancy, labor and lactation.

How does clinical tuberculosis express itself?

If you ask this question, one instinctively thinks of disease of the lungs, pulmonary tuberculosis, consumption. The man on the street knows this. Pulmonary tuberculosis is one of the most common of all diseases, the most frequent cause of death in civilized times; that is, in adult man. Pulmonary tuberculosis is the type of tuberculous manifestation from adolescence on. It is not the type in childhood. This is not to say that children do not develop pulmonary tuberculosis; many do: nor that adult man may not have clinical tuberculosis in any organ or tissue of the body; many have. What I mean is that most tuberculous adults fall ill with pulmonary tuberculosis, while most tuberculous children fall ill with tuberculosis elsewhere than in the lungs. Yet even this statement may need some qualification later on.

There are certain other differences in the expression of tuberculosis at various ages. In adult life the type of disease is extraordinarily chronic though well defined. In infancy the type is very acute and widely disseminated. In childhood the manifestations are extremely

varied: now chronic, now acute, now focal, now generalized, with the tendency however to focalize in places other than the lungs; to be ill defined, chronic and remitting. Generalized miliary tuberculosis and tuberculous meningitis are very common in infancy. Tuberculous adenitis and bone and joint disease are most common in childhood. Tuberculosis of the lungs is far and away the most usual form after childhood.

At present we shall not ask why. We shall simply state the results of universal experience.

When a baby is brought to you with the mother's story that it has always been unusually healthy but that suddenly it has become drowsy and out of sorts and unresponsive and that this condition has kept up for several days with increasing constipation, never forget tuberculous meningitis. You may gaze on the plumpest, healthiest looking baby you ever saw; yet don't let this appearance of nutrition mislead you. Again, the skull of the baby is very elastic. Consequently you may not meet with the headache and other pressure symptoms that a meningitic adult would present. Here then you may be in the presence of tuberculosis in its most fatal form, yet tuberculosis without wasting. For meningeal tuberculosis is an acute disease and, as often as not, will strike down a baby who has been heretofore in perfect health. The concealed tuberculous gland may cause no symptoms, local or general. But the concealed tuberculous gland discharging its caseous contents into the thoracic duct or into a vein can bring on an extremely fulminant disease. This issue is more likely to occur in infants than in older individuals because there has not been time enough to invest the initial focus competently. Therefore the acute types. Therefore, generalized miliary disease, with or without meningitis. Therefore, not enough time for the development of emaciation and cachexia and the other well known signs of tuberculosis in later life. You will see tuberculous meningitis and learn more about it before you finish your course, but always remember that under these conditions you can have tuberculosis without wasting. The most common forms of clinical tuberculosis in infancy are fulminant pulmonary tuberculosis, generalized miliary tuberculosis and meningitis. Any one form can fall like a bolt from the blue and all three run a very acute course. As a rule generalized miliary tuberculosis is associated with meningitis though if the latter is very rapid not enough time elapses to permit an anatomical development of generalized miliary tuberculosis sufficient to give signs in any particular organ.

It is the exception—not the rule—for babies under one year of age with manifest tuberculosis to recover. On Monday you saw Sadie B., who between the age of six and eleven months developed a positive v. Pirquet test and X-ray shadows in the lungs. She is now over eighteen months old and healthy. But it is questionable whether Sadie ever really had outspoken tuberculosis. She had tetany and several attacks of acute otitis media which may have accounted for her symptoms of illness.

With increasing age it is the tendency for the clinical evidences of tuberculosis to become masked and ill defined. As you heard about these children were you not struck by the ever-recurring note that some acute illness sent them to the dispensary? Often it was otitis media. As the acute condition subsided it was noted that the child still had a residuum of symptoms, usually indefinite, that was not traceable to the disease under observation. Careful study then revealed that somewhere the child was tainted with tubercle and sometimes it could be demonstrated that clinical tuberculosis was at work. Few children came to the hospital because their glands were swollen: they came because their throats were sore and because they were out of sorts. Few came because they were undersized or underweight. They came because they had a stubborn cold. Jeanette K. came because of long continued cough, yet she was not diagnosed for months. Some came merely because they had sore eyes. Some had more spectacular symptoms like deformity of the back or hip. Some had pain,—in a joint or in the abdomen. In the bone and joint cases the diagnosis was not difficult. In some cases the obscure constitutional symptoms were in the foreground; the focal signs and symptoms were masked. In Jeanette K. the focal symptoms of cough was marked: the focal signs were lacking for a long time. Vincent M. had a most unusual condition, a suppurative periostitis, and was treated for several years with potassium iodide without relief, only to go through a cycle of peritonitis, adenitis, conjunctivitis and pulmonary tuberculosis, and, upon being detected as tuberculous instead of syphilitic, and proper measures instituted, gained sixteen pounds in six months as against five pounds in the previous five years. The little DeS. girl had a history of shifting signs and symptoms of peritonitis and lung disease over a period of several years and is at present well. The D. girl had suppurating cervical glands at the age of two, then ten years without local symptoms, again to develop suppurating cervical glands in the same location at twelve. Focally the

disease was more or less quiscent, but all this time she was below par, undersized, sickly and undernourished.

Notwithstanding this diversity of manifestation the same threads run through almost all the cases you have seen: tiresome chronicity, treacherous insidiousness, and masked signs and symptoms. Sore eyes; certain skin eruptions; more or less persistent glandular swellings; stubborn cough; long continued abdominal pain, persistent or paroxysmal; lameness; bony deformity;—all come into the net of the tuberculosis specialist. We say that phlyctenular conjunctivitis and certain skin manifestations in infants and children are tuberculous because 100 per cent of such cases react positively to tuberculin (Hamburger) as against a normal reaction incidence of 25 to 50 per cent for the same ages. These chronic glandular swellings, bone disease, and skin and eye afflictions make up the picture of scrofula which filled so prominent a part of the pediatrics nosology of the physicians from the early days of the Salerno School up to the present generation. First named because of the cervical glandular swellings the term at first applied to these alone. Later when it was noted that many other conditions which we have noted were associated with the cervical tumors the term had a much wider significance. Villemin (1865) first showed the identity of scrofula with tuberculosis by inoculation, while Koch (1882) proved its nature by the cultivation of the bacillus. Scrofula or "King's Evil" has been recognized since earliest times in every part of the earth. The term is now in bad odor and had better be dropped (Escherich); yet the fact remains that tuberculous adenitis is now and probably always has been the most frequent form of clinical tuberculosis in childhood. In childhood most of us played with children who had manifest neck swellings and the scarred neck just below the angle of the jaw is to-day a common sight on the street. The disease has a fascinating history which cannot be gone into here. In 1884 Marfan enunciated his law that a person who had had scrofula in childhood and had completely recovered from it would never contract pulmonary tuberculosis. So far as I know this is the first real conception of immunity to tuberculosis on record. The observation was keen and the conclusion embodied perhaps more than a germ of truth. But in your practice of medicine you will find only too many consumptives with perfectly healed neck scars which will make you doubt Marfan's dogma.

Tuberculous disease of glands and bones and joints makes up by far the greater number of cases of manifest tuberculosis of childhood.

Clinical pulmonary involvement is however by no means a rarity. At this age it comes third in any table of incidence. Nevertheless, its type is not so characteristic as that in adult life. The typical ulcerative disease more or less confined to the apex of one or both lungs in not so common a finding. An active process at the hilus is more usual in the young than in adults. Nor is the symptomatology just the same. Young children do not expectorate but swallow their sputum. Every effort however should be made to obtain sputum for examination. This is more often positive for tubercle bacilli than has been generally assumed. Haemoptysis is much more infrequent in childhood. The child will not complain of fatigue so much as the adult and in children this symptom becomes almost a sign and is noted objectively as lassitude or listlessness only when it is marked. Fever, the most common of all symptoms of tuberculosis, is met with perhaps even more frequently in children than in adults. Malnutrition and stunted growth are very common objective features.

As foci, which were once clinical, become walled off, less and less absorption takes place from them, symptoms diminish in severity; and, if the investment is completely competent, absorption and symptoms practically cease, and the disease is clinically arrested or cured. Nevertheless it is questionable whether any anatomical process, which has been extensive enough to cause clinical symptoms, is ever completely healed. A residuum usually remains, held in check as it were by a fibrous envelope which may or may not be sufficient to hold it down through the accidents and stresses of life. There may be months, years, or a lifetime of freedom from tuberculous disease. But in most people who have once had clinical pulmonary disease and who have recovered, single or successive eruptions from the old, once arrested focus take place and illness again manifests itself. It is this fact which adds another characteristic feature to clinical tuberculosis; namely, its tendency to relapse. Hardly any other feature has been longer noted and more commented upon than this relapsing element in tuberculosis. It is this that obscures the ultimate prognosis and makes the apparently well patient's future so uncertain. In a few words I have tried to indicate to you the anatomical basis for this relapse.

You will now understand how the situation is something like this: Let us take a thousand clinically healthy children. None has ever had symptoms of tuberculosis, yet cutaneous test shows us that every one has focal tubercle. Five hundred grow and develop, resisting reinfection

from without, and go through life keeping their original focus well under control, and never exhibiting disease. Two hundred have just the proper conditions at work so that when measles or naso-pharyngeal inflammations or tonsilitis or whooping cough comes along the focus is broken through or unlocked, a fresh eruption or dissemination of bacilli occurs, and symptomatic disease results. A few of these die. Most recover. Some will always remain well; some are relapsing at very frequent intervals: and of these latter, some will die and some again finally recover. Three hundred of the original one thousand will perhaps go through a healthy childhood only to break down in adolescence or adult life under the economic and physiological stresses of these periods: and these will go through the cycle, though in a modified way, which we have just outlined for children. I do not mean that these figures are exact. I merely use them to illustrate roughly what is continually taking place.

From three or five years to twelve or fifteen is the golden age of the human span so far as tuberculosis is concerned. Speaking in generalities we may say that at this period the disease is milder than at any other time of life. And it will astonish you how many of your apparently desperately sick children will recover from tuberculosis. As in infancy, generalized miliary or meningeal tuberculosis will carry off most of those who die. But if these complications do not develop the immediate outlook is uniformly good. Remember, however, that these cured children furnish many of the chronic pulmonary cases of adult life. Even though cured, such children should be looked upon as cripples. They are like a man with one leg who tries to run a race with a normal man. Therefore, wherever possible their future life should be planned with this conception firmly in mind. They must concentrate their talents—put all their eggs in one basket—if they are to be useful members of society and remain free from tuberculosis. You will accordingly soon catch the idea that the treatment of tuberculosis does not stop with the arrest of symptoms. It means that you must watch and regulate a well person's life perhaps for years, if you are to do your part in warding off relapse and preventing an ultimate death from phthisis.

THE CONTROL OF TUBERCULOSIS[1]

H. M. BRACKEN

Minneapolis, Minnesota

Instead of reading a paper, I wish to present certain topics for discussion, as shown in the following questionnaire. As a public health administrative officer, I need advice on these topics from men who are specializing in the treatment of tuberculosis, as many present here to-day are doing.

QUESTIONNAIRE

1. Can the danger from an open case of tuberculosis be considered negligible so long as there are no small children associated in residence with said patient?
2. Is it to be admitted that the infection of adults with tuberculosis can be considered a negligible quantity?
3. Given the case of a babe that has been living with a tuberculous mother under conditions permitting possible infection of child before the condition of the mother is known: What course should we follow with the child? Shall we assume that it is already infected from the mother and that therefore no action need be taken looking to its possible future infection from the mother?
4. How do so many children become infected with tuberculosis in infancy, when but a very small percentage come in contact with open cases of tuberculosis?
5. Is tuberculosis a public health problem?
6. Should every case of tuberculosis be reported?
7. Should there be sanitary supervision of every case of tuberculosis?
8. Has the sanatorium a place in the control of tuberculosis?
9. Should all tuberculous patients be sent to an institution (sanatorium or hospital) for the tuberculous?
10. Should all open cases of tuberculosis be compelled to stay in an institution (sanatorium or hospital) for the tuberculous?
11. What should be done with the incorrigible tuberculous?

[1] Presented at the meeting of the American Climatological and Clinical Association, May 30, 1917.

12. Why disinfection after tuberculosis?

13. To what extent should sedatives (morphine, codeine, or heroine) be used to allay cough or secure sleep, in the treatment of tuberculosis patients?

14. What is a preventorium?

1. *Can the danger from an open case of tuberculosis be considered negligible so long as there are no small children associated in residence with said patient?*

Personally, I do not feel that we would be justified in any such procedure, and yet we hear so much about all tuberculous infection occurring in childhood that one might almost think the possibility of infecting adults could be ignored. Undoubtedly a large percentage of infection does occur in childhood, but are we to assume that all individuals who later develop tuberculosis were exposed to tuberculosis in childhood? The reverse cannot be proved, possibly, but the histories of some cases in the country where the life of the individual is well known from childhood to adult age hardly bears out such a possibility. If such a position is tenable, then the public health problems in handling tuberculosis are greatly simplified.

2. *Is it to be admitted that the infection of adults with tuberculosis can be considered a negligible quantity?*

This topic really has a bearing on the first question, because if we can consider that adults are not affected to a material extent we can drop the problem of danger to adults.

3. *Given the case of a babe that has been living with a tuberculous mother under conditions permitting possible infection of child before the condition of the mother is known: What course should we follow with the child? Shall we assume that it is already infected from the mother and that therefore no action need be taken looking to its possible future infection from the mother?*

I do not feel that we should make any such admission. The danger has been present, without doubt, but we would not be justified in assuming that infection had unquestionably resulted and that there was no need of instituting protective measures even at this late date. Recently, however, an excellent clinician stated in discussion:

Ten years ago we heard much about the necessity for the care of the advanced consumptive in order that we might prevent the infection of his children. We know that the majority of those individuals, long before they go

to the sanatorium, have had every opportunity to infect the younger members of their households. It is reasonably certain that even one exposure of a susceptible child to an open case is all that is needed to so infect that child that he may have pulmonary tuberculosis even thirty or forty years afterwards. The idea of cumulative infection is no longer tenable. It does not take a series of exposures to infect the average child.

4. *How do so many children become infected with tuberculosis in infancy, when but a very small percentage come in contact with open cases of tuberculosis?*

It seems to me the statistics on infection in infancy are not quite fair to the children living in homes where there are no open cases of tuberculosis. If a large percentage of infection were from milk it might be easy to answer this question, but the statistics do not bear out this proposition. We know that a large percentage of the children grow up in homes where there are no open cases of tuberculosis. We have given up the old idea of dust infection. It is generally accepted, I believe, that there must be rather close association with the tuberculous individual in order to secure infection in the majority of cases at least. With these facts, it certainly is difficult to explain how all of the tuberculosis which we see owes its origin to infection in childhood.

5. *Is tuberculosis a public health problem?*

I had supposed it was, and yet your answers to this question must depend upon your answers to the four preceding questions.

6. *Should every case of tuberculosis be reported?*

The answer to this question depends on the answer to the preceding. I assume that every case of tuberculosis should be reported. I know that many cases are not reported, but I also know that the percentage of reported cases is on the increase. If tuberculosis is a public health problem, then most certainly should every case be reported.

7. *Should there be sanitary supervision of every case of tuberculosis?*

The answer to this question must depend largely upon your answers to no. 5. My personal opinion is that there should be. This does not mean interfering with the physician who has charge of the patient, but it does mean a complete record of all cases occurring over a series of years. This is important both from a statistical and a preventive point of view.

8. *Has the sanatorium a place in the control of tuberculosis?*

As I understand it, there are three types of institutions coming under this title, namely, (1) the private sanatorium; (2) the sanatorium for the early case only; and (3) the general sanatorium.

The private institution is undoubtedly for the care of the patient only. The physician operating such an institution knows that he can take care of his tuberculous patients easier in an institution of his own than in the home of the patient, and he therefore persuades his patients to go to his institution for this reason.

The sanatorium for the early case, as represented by many of our state institutions, may be considered as having to do largely with the care and treatment of the patient. In other words, we are trying to give the patient a chance to get well. Of course these institutions may be recognized as a part of the control of the disease in so far as it is our intent to arrest the disease if possible in the early stage, but in this instance the control may also be considered a part of the care of the patient.

The general sanatorium houses all types of cases. The open case is recognized as the dangerous case. All of the open cases in these general institutions should, therefore, be considered from the viewpoint of both care of the patient and control of the disease, for we realize that these cases are liable to spread infection if conditions are favorable to their so doing. It is not simply a question of housing the patient until he gets well or dies, nor is it a question of treating the patient. It is a question of protecting others.

9. *Should all tuberculous patients be sent to an institution (sanatorium or hospital) for the tuberculous?*

By no means. It should be for those who are looking at the question from the protective point of view to determine whether or not a patient can be taken care of at home without endangering the health of others. A considerable number of patients who have means can be properly cared for at home. It is only necessary to take an advisory attitude toward these, directly or through their physicians. One thing we should be sure of, namely, that those who are cared for at home are not endangering others. In dealing with this type of patient we should keep in mind the ages of the other members of the household. We should not confine ourselves to the question of financial conditions alone.

10. *Should all open cases of tuberculosis be compelled to stay in an institution (sanatorium or hospital) for the tuberculous?*

The statement has been made that if you answer this question in the affirmative you will drive patients away from the sanatorium, for you will be making of it a custodial institution. I presume you all realize that the home is a custodial institution when you are dealing with infectious diseases. It should be for those who are looking after the prevention of the infection of others to determine whether or not the patient should stay in an institution. It is not necessary to use force in dealing with these patients. There are many ways in which they may be persuaded to do as you wish them to. For example, a patient may not wish to remain in an institution and may return home. The sanitarian who is doing his duty will follow the patient to his home, directly or through the health authorities, and determine whether or not he or she can safely stay there. If the conditions are not satisfactory at home, it is for the sanitarian to determine whether they can be made so or whether the patient must return to the institution. If the latter, then the patient should be dealt with firmly but humanely.

11. *What should be done with the incorrigible tuberculous?*

The answer to this is, make them obey. There should be a state institution for the incorrigible tuberculous. It need not be a very large one, for if these individuals knew that they either had to do as they were told in the sanatoria or be sent to the institution for the incorrigible, most of them would prefer yielding to discipline. I am of the opinion that no one should be discharged from an institution as a part of discipline. If his habits have a tendency to demoralize the service at an institution, he should first be given a warning. If the warning is not sufficient, then he should be committed to the institution for the incorrigible. A plan for commitment might be adopted similar to that now in use for committing the insane to hospitals.

12. *Why disinfection after tuberculosis?*

I included this question for a purpose. In a pamphlet issued by the National Association for the Study and Prevention of Tuberculosis, the advice is given:

> See that you and your children do not move into any room or house or work-place where a consumptive or a person with a chronic cough has lived,

worked, or died, until it has been carefully disinfected by the board of health or your doctor. Any room can be made perfectly safe without very much trouble. First, by formaldehyde disinfection. Hang up by two corners in each room a sheet thoroughly wet with a quart of 40 per cent formaldehyde solution which can be gotten cheaply at any drug store, after first shutting all the doors, windows, and fireplaces, and stopping up all cracks with strips of newspaper put on with starch paste. Keep the room shut for twenty-four hours, and then keep all windows wide open for two days. There are several better but more expensive methods of disinfection with formaldehyde which you can learn of from the board of health or your doctor.

I had supposed that this sheet method for formaldehyde had gone out of use. What does disinfection mean? Probably in a large percentage of cases of supposed disinfection the whole process consists of nothing more or less than the burning in the room of a so called formaldehyde candle. I am thoroughly disgusted with the usual methods followed in the attempt at disinfection. Certain boards of health, recognizing the difficulty of securing proper formaldehyde disinfection, have suggested, as a substitute, thorough house-cleaning and renovation. The renovation of a house where a tuberculous patient has lived can be easily carried out.

13. *To what extent should sedatives (morphine, codeine, or heroine) be used to allay cough or secure sleep, in the treatment of tuberculous patients?*

I have not been in active practice for several years, but it seems to me the amount of sedatives to be given to tuberculous patients should be very small indeed. A short time ago, however, I was informed that in a certain institution a man was receiving a nightly dose of, presumably, morphine, hypodermically, in order to give him sleep. He had been in the institution about ten months and was probably the senior patient. There was even a question as to whether this man was tuberculous. The sputum examinations from time to time had always been negative. The diagnosis of the physician who brought this patient to my attention was "chronic bronchitis and asthma." The man was practically becoming a drug habitué from this nightly hypodermic.

14. *What is a preventorium?*

A short time ago I was at a committee meeting where the question of establishing a preventorium was under discussion. I had not been present at some of the previous meetings and I rather objected to the

plans as laid down at this meeting. It happened that all of the physicians in the room agreed with me but I learned afterwards that the social workers and a medical school inspector present did not agree with me. These latter wanted an institution which they called a preventorium for a certain type of children, but when the whole question was thoroughly analyzed, as nearly as I could make out, what they really wanted was what was known a few years ago as the open air school, a place for taking care of under-fed, under-nourished, anaemic children. I shall be very glad indeed to have the men who are present and who are familiar with such matters give me their definition of a preventorium.

A CLINICAL REPORT ON ONE HUNDRED AND THIRTY-ONE CASES TREATED BY ARTIFICIAL PNEUMOTHORAX[1]

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I had an opportunity of presenting a brief paper on the subject of artificial pneumothorax during the meeting of your association at St. John in July, 1914. At that time we had under consideration but twenty-one cases.

During the past three years we have increased this number to one hundred and thirty-one cases; and I wish now to consider the clinical findings so far presented.

The efficacy of this form of treatment depends mainly upon the degree of functional rest that can be established and maintained in the compressed lung, and the lessening of toxemia by absorption from tuberculous foci. Each case, of course, must be viewed and treated on its own merits.

Up to the present time we have attempted treatment in advanced cases, some moderate, others far advanced; in fact, we have but one incipient case among those under consideration, the compression in this case having been established to control an apparently irremediable cough. When we consider the class of case under consideration and the almost hopeless outlook presented under sanatorium treatment we cannot help feeling pleased, although perhaps not satisfied, that the results obtained are so favorable.

Our experience has been that the cases in an institution do better than those at home.

REASONS FOR ATTEMPTING ARTIFICIAL PNEUMOTHORAX. In the choice of our cases for starting artificial pneumothorax the first considerations are the possibilities of:

1. *Lessening the toxemia*, and by so doing, the distressing symptoms

[1] Read before The Canadian Medical Association, Montreal, Quebec, June 13, 1917.

caused thereby. We refer more particularly to fever, night sweats, expectoration, loss of weight and the control of cough.

2. *Splinting the lung;* and by this immobilization, impeding the means of spreading infection through the blood and lymph streams.

3. *Control of haemorrhage, when present.*

4. *Psychological effect.*

Reasons for Not Attempting Artificial Pneumothorax. While we feel that the theory regarding artificial pneumothorax is sufficiently logical to warrant precise results, we have, up to the present time, felt it unwise to treat those who have every chance of doing well under ordinary measures of treatment; and we always keep in mind the question of remote complications which might occur. Chief among the latter, and in fact the only complication of great importance is the formation of pleural effusion. We would not advise artificial pneumothorax in chronic fibroid cases, unless they are haemorrhagic; while we have considered a tuberculous involvement in the bowel and kidney, diabetes, a serious heart lesion, or arterial sclerosis as among the complicating factors which militate against the use of this measure.

Classification of Cases. Our experience has led us to consider artificial pneumothorax as being indicated in progressive and stationary cases; or in patients suffering from haemorrhage, and we have classified our observations in accordance with results expected as:

1. *Curative.*

2. *Palliative and as an ultimum refugium.*

Factors Considered Before Attempting Artificial Pneumothorax.

1. *Chest involvement.*

a. Bilateral or unilateral: While promising results are more likely to be obtained in strictly unilateral cases, our statistics show that 71 per cent of our cases had involvement on both sides of the chest. While it is essential that adequate compensation be established, still it is quite possible, in many cases, to obtain favorable results in bilateral cases. Although our findings will not support the supposition that the collapse of one lung produces a beneficial and curative result upon the disease in the other lung, nevertheless in some cases a lessening of activity has been noted in the less diseased side of the chest.

b. Side compressed: Compressions have been made on the right side in 42 per cent and on the left in 58 per cent of our cases. We have found no particular difference in the ultimate results although there may be more immediate effects on the heart action, respiration, and digestive system with left sided compressions.

c. Age: We have not had an opportunity of treating children, while the age of treatable cases has not been in any way a factor worthy of consideration.

d. Duration of disease: Most pronounced results have been obtained in the more progressive than in the chronic fibroid type.

e. History of previous pleurisies: The question of a history of pleurisy has had no bearing upon the results of pleural space inflation; in some cases marked pleuritic adhesions were met with where no history had been given and vice versa. Diaphragmatic adhesions are likely to give most trouble.

2. *The use of X-ray:* Fluoroscopic and radiographic examinations should be made in all cases. In 75 per cent of our cases the X-ray was used; but in some cases we were able to find a partial or complete pleural space which the Roentgen ray did not reveal. Pleuritic adhesions are never entirely absent in advanced tuberculous lung conditions, so that we feel that puncture attempts should be made in selected cases, no matter what the physical or Roentgen examination findings may be.

3. *General condition of patient, including symptoms before operation.* In most advanced tuberculous cases there is a condition of general malaise with a loss of weight and strength. With this we find cough and expectoration present, and the results of toxemia, such as fever, night sweats, secondary anaemia, etc.

Immediate and Ultimate Results Expected. After collapse, in so far as symptoms are concerned, we find that the cough and expectoration may be more troublesome; but this is followed by a marked decrease. Lessening of fever is usually noted within the first seventy-two hours and there is a definite and continuous improvement in the patient's general condition. With the improvement of symptoms there is a marked change in the patient's mental attitude. Patients are always willing and anxious for further treatment. This is not only due to the relief of symptoms but also to a stimulating psychological effect.

TECHNIQUE.

1. Preparation of patient. The intercostal spaces are rendered wider by placing a small soft pillow under the axilla. The skin is thoroughly painted with tincture of iodine, and the skin and parietal pleura anaesthetized with a 1 per cent solution of novocain. We used morphine in a few early cases but do not advise it. In two cases we resorted to the assistance of ethyl chloride.

2. Preparation of operator. The hands and arms after being thoroughly scrubbed are immersed in a solution of lysol. We have made 2383 punctures, without an appearance of sepsis.

3. Instruments and their preparation. We use a 1 cc. Record hypodermic syringe with a small bore short needle for anaesthetizing purposes. We have used and discarded the Saugman and many other needles especially made and advised for artificial pneumothorax, and use one made of platinum, 2 inches long, of medium bore, and with a blunt non-cutting point. This needle is used for initial attempts as well as for refills. Where the tissues are particularly resistant, a needle with a sharper point can be made use of. All needles are fitted with ordinary wire stilettos. A piece of small sized rubber tubing, fitted at one end with a glass tube, is used for connecting the needle with the larger rubber tubing of the pneumothorax apparatus. This small tube and all instruments used, are boiled before use in each case, and kept in alcohol until used.

4. The location of puncture. We have found the post-axillary line preferable, although the exact location will depend on adhesions. The lower the puncture the better, in order that diaphragmatic adhesions which are the most difficult to deal with can be peeled off or loosened.

5. Mode of puncture. We have found it best to make a puncture in the skin and subcutaneous tissue just below the upper edge of the rib, having the needle rest upon the upper part of the latter, anaesthetizing the parietal pleura first and the skin last. We find that by making a puncture in this way a valve effect is produced, thus preventing to some extent the occurrence of surgical emphysema.

6. Gas. A small amount of oxygen is used in the first fill, 100 cc. being sufficient; and this is followed with nitrogen or filtered air. The entire initial inflation is made with an amount not exceeding 500 cc. In cold weather it is best to warm the gas by having a part of the rubber tube immersed in hot water.

7. Pressure. We resort to water pressure only, this pressure being somewhat different in the four machines we have in use, owing to the style of the machine and the size of the glass containers. We never use bulb produced pressure. The gas is never allowed to enter the chest until we are satisfied with our manometric readings, and until we have fitted the shank of the needle with a Record syringe and assured ourselves that the needle is in the pleural space, and not adjacent to it in the lung or in a blood vessel. The inflation should be made slowly and pressure not increased too rapidly.

COMPLICATIONS WHICH MAY PRESENT THEMSELVES.

1. While operating. The patient may complain of pain. This may be reflex, or it may be caused by the breaking down of adhesions or through pressure. If from the latter, this fact will be readily noticed from the manometric readings. If the pain is severe or if one is convinced that adhesions are present, and but a small pleural pocket is being filled, the operation should be discontinued. Gas embolism is possible but is not probable, if due precautions are taken to avoid it.

Pleural shock has been cited as a complication during the operation, but proper and thorough anaesthetization of the parietal pleura will prevent this. We have had to discontinue treatment in a few cases on account of pain, but we have had no occurrence of embolism or pleural shock.

2. After operating. The patient may be distressed through shortness of breath, although this is not frequent, and need not be, if the operator is carefully noting the readings on his manometer and thus determining the size of the pleural space, and the degree of mediastinal rigidity. Skin sepsis may occur, but if so, carelessness is the cause.

Some patients have no desire for food after the first few compressions, more especially left-sided cases; but in the majority of cases no such condition is experienced if the amount of gas is not too great.

3. Surgical emphysema. Some few cases of superficial emphysema were observed as well as two cases with gas around the mediastinal tissues and higher up in the tissues of the neck.

4. Pleural effusions. We consider the formation of fluid to be the one serious complication that can occur during treatment by artificial pneumothorax.

Effusions have formed in 20 per cent of our cases. Most of

these have occurred after six months' treatment, mostly in cases with marked cachexia and particularly those who have indulged in considerable activity.

Although many theories have been advanced, no definite cause has been assigned. Our impression is that the cause is mainly infection from within and effusion has been more frequent in those of a cachectic type, with acute ulcerative processes, or with an acute mixed infection present. Our experience has also led us to believe that patients indulging in sudden unaccustomed exercises are more prone to develop pleural effusions, and also that large inflations at high pressure have been determining factors.

In the majority of cases the fluid is apparently sterile at first but gradually become purulent and in most end cases the tubercle bacilli can be demonstrated.

The amount varies in individual cases. In four of the twenty-six cases in which fluid occurred, the amounts were small and did not recur after one oxygen refilling. We have used oxygen refilling in some cases in an endeavour to assist fluid absorption.

Frequency of Refills. The frequency of refills depends upon several factors and these briefly stated are:

1. Absorption.

a. This will differ in each individual case though the reason is not explainable.

b. Activity of patient. The gas will be absorbed more rapidly in those patients who are active than in those who are on rest.

c. Atmospheric conditions. In cold weather the gas is absorbed more readily.

2. Amount of gas.

a. This will depend on the variation of pressure and in accordance with the process of absorption.

b. Moderate amounts of gas are advised. We very seldom exceed 1000 cc. while the average amount is 500 cc.

c. The amount of gas will vary in each individual case.

d. We never exceed 500 cc. of gas (nitrogen and oxygen combined) in the first operation.

e. Frequent refills at short intervals are preferred to large refills at greater periods, as in this way more complete compression can be sustained.

f. Reference should be made to a skiagram or the fluoroscope made use of in determining frequency and amount of refills.

g. No definite degree of absorption of nitrogen can be depended upon. This will vary with the case and the stage of treatment.

h. Treatment should be continued indefinitely or until convinced that complete fibrosis has developed.

POSITION OF MEDIASTINUM. Varying degrees of mediastinal mobility are noted in different cases, and this will be affected by adhesions. These adhesions may be diaphragmatic in character or established in the upper parts of the pleura or around the mediastinal glands. While the manometric readings may be of some service as a guide, we have not found them to be of positive value as an indicator.

X-RAY PLATE AND SKIAGRAM READING. Some method of measurement is required in order that we may get definite readings. To aid us in this matter we are now using a special ombreometer and scaled chart recording fluoroscopic findings.

SUMMARY

1. Artificial pneumothorax is of value not only as a palliative measure but also as a curative one.

2. Although unilateral cases promise the best results, a moderate bilateral involvement is not a contraindication.

3. Cases treated in a sanatorium give the best results, but this is not an absolute necessity.

4. The skiagram and fluoroscope are essential.

5. A small initial fill, not exceeding 500 cc. of gas, and subsequent frequent refills not exceeding 1000 cc. are points of importance.

TABLE

Classification of cases and results of treatment

	TOTALS	RIGHT LUNG	LEFT LUNG	UNILATERAL	BILATERAL	PALLIATIVE	CURATIVE	STILL UNDER TREATMENT	STILL UNDER TREATMENT WITH FLUID	DISEASE ARRESTED	IMPROVED	FAILED	DIED	REMOVED FROM OBSERVATION	TREATMENT DISCONTINUED (ADHESIONS)	FLUID	DIED	REMOVED FROM OBSERVATION	DURATION OF TREATMENT, 1 TO 6 MONTHS	7 TO 12 MONTHS	1 TO 2 YEARS	2 TO 3 YEARS	EARNING A LIVELIHOOD OUTSIDE OF INSTITUTION
Incipient A	1	—	1	1	—	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	1	—	1
B	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
C	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	1	—	1	1	—	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	1	—	1
Moderately advanced																							
A	21	8	13	12	9	9	12	15	—	11	8	—	2	—	3	1	2	—	7	4	7	3	6
B	33	14	19	12	21	13	20	16	1	10	15	7	—	1	7	4	—	5	14	7	7	5	4
C	1	1	—	—	1	—	1	—	—	—	1	—	—	—	1	—	—	—	1	—	—	—	—
Total	55	23	32	24	31	22	33	31	1	21	24	7	2	1	11	5	2	5	22	11	14	8	10
Far advanced																							
A	10	5	5	1	9	6	4	6	0	4	2	3	1	—	3	1	—	—	6	1	3	—	1
B	34	16	18	9	25	26	8	10	—	2	15	9	6	2	8	3	4	9	18	6	6	4	1
C	31	11	20	3	28	30	1	8	1	4	9	6	11	1	5	3	10	4	13	8	4	6	3
Total	75	32	43	13	62	62	13	24	1	10	26	18	18	3	16	7	14	13	37	15	13	10	5
Summary	131	55	76	38	93	84	47	56	2	32	50	25	20	4	27	26	16	18	59	26	28	18	16
Percentages		42	58	29	71	64	36	44		24	38	19	15	3	20	20	12	14	45	19	21	13	12

FIGS. 1 TO 5

A series showing a case in which we have had the very best results. The active lesion was on the left side. There were no adhesions and the compression was progressive without any complicating factors.

FIG. 1. Condition of patient before artificial pneumothorax was performed.

FIG. 2. The compression after six months (14 refills).

FIG. 3. The compression after nine months (18 refills).

FIG. 4. The compression after twelve months (22 refills).

FIGS. 4 and 5 shows lung before and after refill. In this case we were able to get a complete compression with very little dislocation of the heart,—an example of an immobile mediastinum.

FIGS. 6 TO 10

FIGS. 6 to 10 are taken from a series showing progressive compression of the right lung. Notwithstanding the diaphragmatic adhesions, the gas getting under the lung both internally and externally to the adhesion raising the base. There is also seen a marked adhesion at the apex. We have been unable, as yet, to break down either of these adhesions.

FIG. 6. Taken before artificial pneumothorax was performed.

FIG. 7. After first refill.

FIG. 8. After third refill.

FIG. 9. After the seventh refill.

FIG. 10. After the ninth refill.

FIGS. 11 TO 12

FIG. 11. Taken after artificial pneumothorax had been performed eighteen months. Note that the established compressed left lung is behind the sternum, and the heart also, an example of a mobile mediastinum.

FIG. 12. Taken after three years. Note position of lung and heart as well as the condition of the right lung, notwithstanding the fact the patient is in excellent condition. This plate is unique as it shows deposition of lime salts in the cartilages on the left side. For the first eleven months the patient had adhesions which prevented the lung from being wholly compressed. Finally these were broken down with the above results.

FIGS. 13 TO 16

FIGS. 13 to 16. Are examples of irregular compressions of the lung due to pleuritic adhesions at various points.

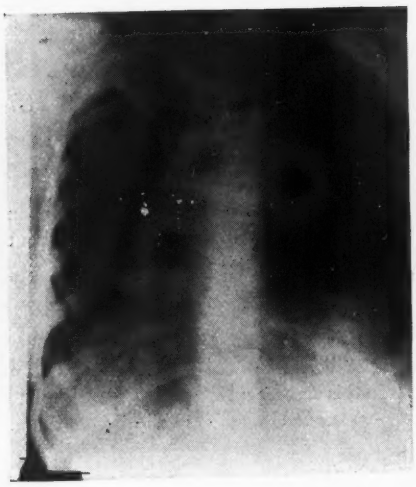

FIG. 1

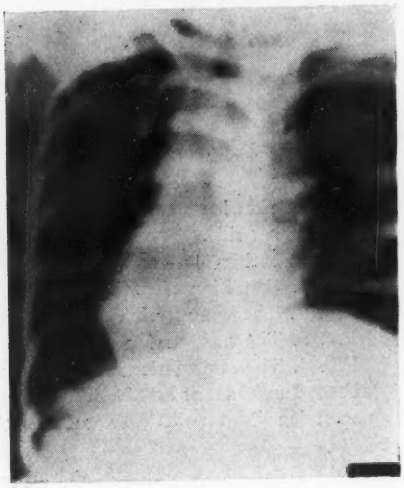

FIG. 2

FIG. 3

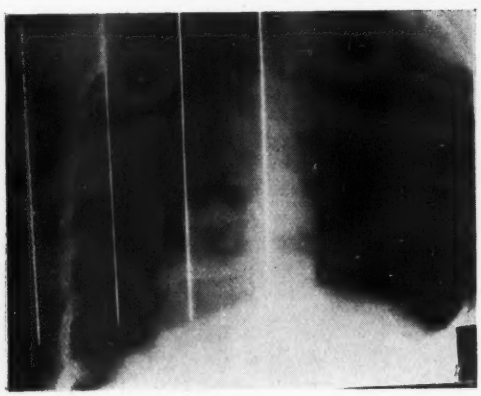

FIG. 4

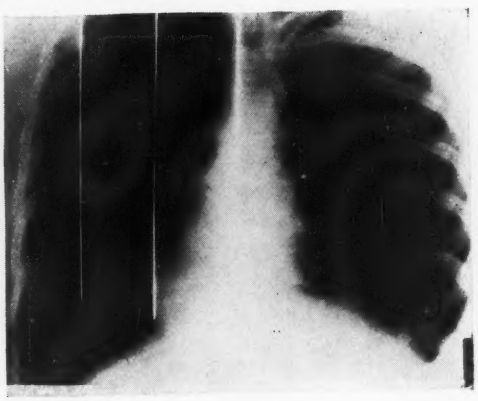

FIG. 5

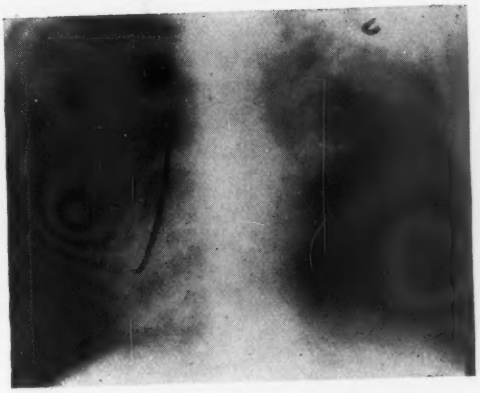

FIG. 6

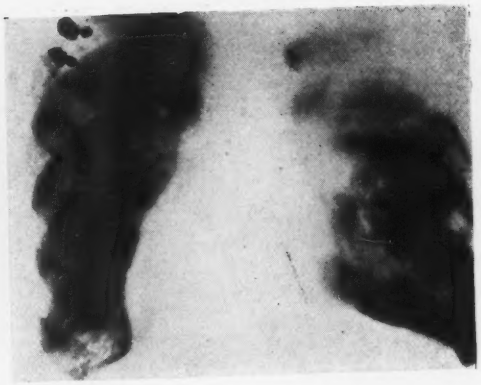

FIG. 7

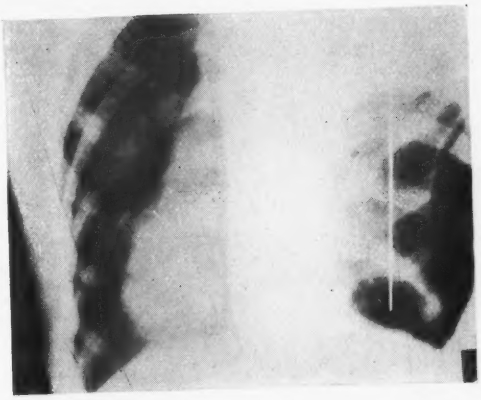

FIG. 8

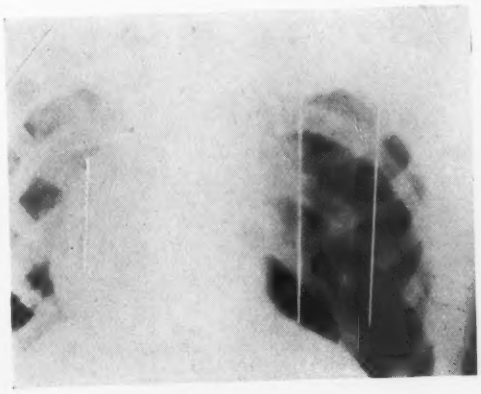

FIG. 9

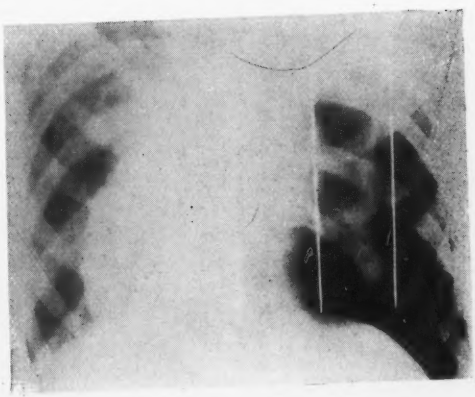

FIG. 10

FIG. 11

FIG. 12

FIG. 13

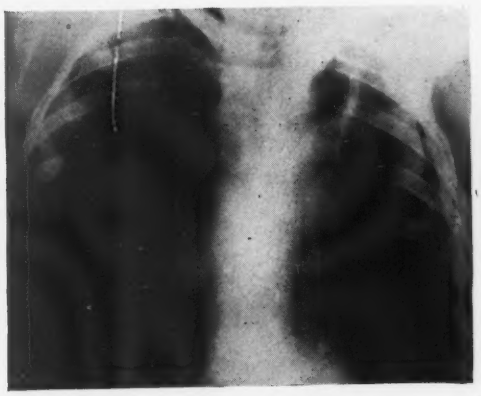

FIG. 14

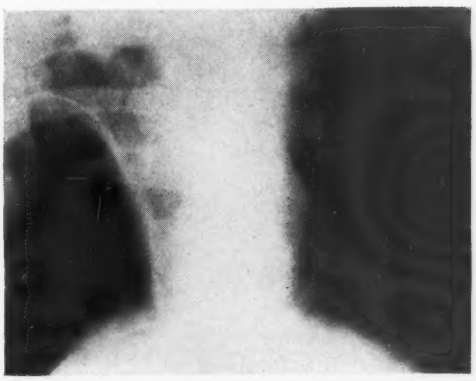

FIG. 15

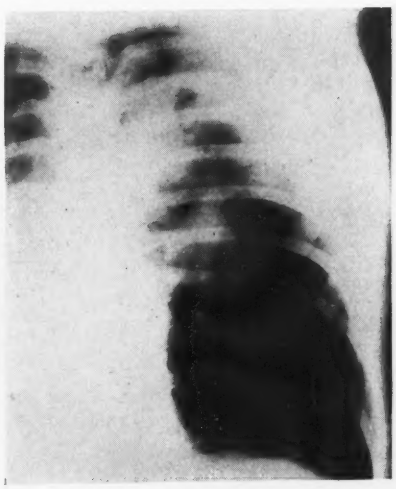

FIG 16

AN ACUTE PULMONARY ABSCESS TREATED BY ARTIFICIAL PNEUMOTHORAX

SALING SIMON AND SAMUEL SWEZEY

From the National Jewish Hospital for Consumptives, Denver, Colorado

Medical literature is exceedingly scant upon the subject of the treatment of acute pulmonary abscess by the use of artificial pneumothorax. Only three cases are reported as having been thus treated in the available American literature. The first case was interlobar empyema reported by Greer in the *Journal of the American Medical Association* of April 1, 1916. Two cases of acute pulmonary abscess were reported by Tewksbury in the same publication of March 10, 1917, as having been treated with artificial pneumothorax.

We wish to add the report of the following case of acute pulmonary abscess successfully treated by compression of the affected lung with nitrogen gas:

Mrs. R. A., aged twenty-two, housewife, was admitted to the National Jewish Hospital for Consumptives on June 15, 1917. Family history in regard to tuberculosis is negative. Previous history negative up to June, 1916, (a year before admission) when she began to cough and in November, 1916, her sputum was found positive for tubercle bacilli. She then went to San Antonio, Texas, where she grew gradually worse. About January, 1917, she was taken acutely sick with "la grippe." Her temperature gradually rose to 103° F. with chills, night sweats, diarrhoea, loss of weight, and expectoration of a foul smelling, thick, greenish sputum. The attack lasted about two weeks, when her temperature came down to normal and she began to improve. Two weeks later she developed another attack similar to the one just described, which was followed by an interval of two weeks remission, then a third attack in March lasting about three weeks. During the whole month of April she was free from such attacks, while the expectoration changed to her regular sputum and she gained 15 pounds. From May 1, she began to have attacks every two weeks. When she was admitted on June 15 her general condition was good; she was well nourished, weight 159 pounds, temperature, pulse and respiration normal, with the exception of a slight shortness of breath, no pain. Examination on June 17, two days after admission, by

Dr. Swezey, showed an area of dulness extending from the third to the seventh rib on the left, both front and back, continuous with the cardiac dulness. Auscultation revealed subcrepitant râles over the whole of the left lung with much diminished breathing corresponding to the area of dulness. Above this area, vocal and whispered bronchophony with bronchial breathing were present. The right lung showed fine crepitation scattered over the back. The sputum was positive for tubercle bacilli (1 per field). On June 17, she was fluoroscoped by Dr. Wasson who diagnosed pleuritic thickening of the whole of the left and some involvement of the upper right lung. Opposite the second interspace on the left was a small area suspicious of a cavity. Corresponding to the area of dulness was a dark shadow, continuous with that of the heart. She continued feeling well until July 5 when her temperature rose rapidly to 102° F., and remained so for three days with slight morning

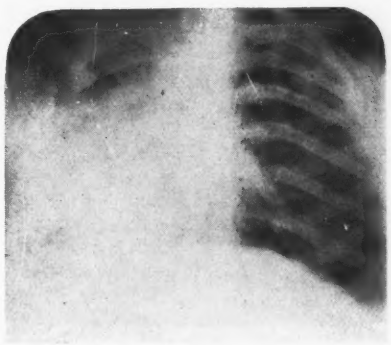

FIG. 1. MRS. A. MARKED DENSITY THROUGHOUT LEFT LOWER LOBE
Peribronchial thickening throughout right side

remissions; and this septic temperature continued for a whole month, ranging between 97° F. in the morning and 101° F. in the afternoon. The pulse corresponded to the temperature. During that month she had frequent severe chills, sweats, vomiting, diarrhoea alternating with constipation, pain in the left side, shortness of breath, coughing, and expectoration of a thick, yellowish sputum, which had no offensive odor, and albumin in the urine.

On July 6 the blood was negative for malaria. On July 17, the Widal was negative. On the eighteenth, the leucocyte count was 19,000; polymorphonuclears, 82 per cent; large mononuclears, 3 per cent; small mononuclears, 15 per cent. On July 20 she was examined by Dr. Simon who found practically no change from that found by Dr. Swezey a month previous. On July 25 an X-ray plate was made and showed the condition pictured in figure 1.

Her sputum was found to contain staphylococci and streptococci. A diagnosis of pulmonary abscess communicating with a bronchus was made and it was decided to try compression by artificial pneumothorax in preference to the usual treatment of rib resection and drainage, provided the pleural cavity was not obliterated as it seemed to appear from the plate.

In the meantime the patient continued to get worse and on August 5 her temperature was up to 103° F. and remained so until the sixth when she was given the first injection of 350 cc. nitrogen gas after an unsuccessful attempt to aspirate the pus. The water manometer registered (−3, −6). Her temperature dropped to normal the same evening, rose to only 100° F. the next day, and on August 8, two days after the first injection, she was again given 500 cc. when the pressure obtained was $(-\frac{3}{4}, -2)$. After the second

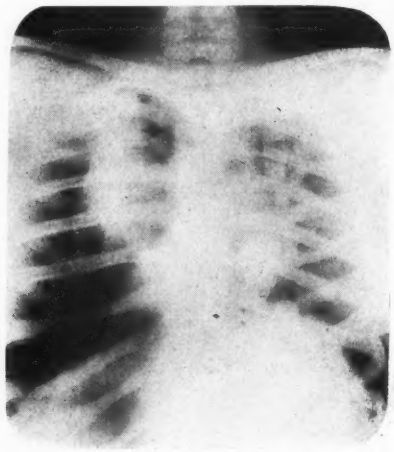

FIG. 2. MRS. A. PNEUMOTHORAX ON LEFT SIDE
Collapsed lung adherent at left apex. Inflammatory mottling on right

injection all the symptoms disappeared as if by magic. Her temperature became normal and has remained so to date. After the first injection, her expectoration increased to about four times as much as it was before, gradually diminishing until at the present time it is almost negligible. On August 31 her leucocyte count fell to 14,200; polymorphonuclears, 62 per cent; large mononuclears, 3 per cent; small mononuclears, 33 per cent; transitionals, 3 per cent. Fluoroscope on August 11 showed the left lung compressed upward to the level of the fifth rib. She has gained in weight and strength and is now not only up and about, but also participates in the graduated working system of the sanatorium. Her leucocyte count October 17, 1917, was 10,600; polymorphonuclears, 57 per cent; transitionals, 7 per cent; large

mononuclears 11 per cent; small mononuclears, 20 per cent; eosinophiles, 5 per cent. We are still continuing the artificial pneumothorax treatment. To date she has received 11 injections, each varying in amounts from 400 to 500 cc. Her left lung is almost completely collapsed as shown in figure 2.

The use of artificial pneumothorax apparently gives a simple and successful method of handling this class of cases. Whenever the abscess cavity communicates with a bronchus it is practically the only safe and available method and even where the abscess does not communicate with a bronchus, it would appear the part of good judgment to try artificial pneumothorax with the hope that the abscess may be obliterated. Bronchiectatic cavities do not appear to have been as successfully treated by this method, yet, even in this class of cases it should be given a trial. This much can be said for the use of gas compression: it is apparently free from any danger when the gas injections are given in small quantities and at frequent intervals.

A CASE OF PLEURAL SHOCK

J. B. McKNIGHT, H. F. GAMMONS AND W. M. KNOWLES

From the State Tuberculosis Sanatorium, Carlsbad, Texas

As the literature on pleural shock has been so limited and the reports of the cases so varied in symptomatology, we feel justified in reporting the only case of sixty-five treated by artificial pneumothorax by us. We have made eight hundred entrances into the chest and have not given morphine before puncture.

We have used cocaine as a local anaesthetic in all cases, as a rule using one-half of one per cent solution, and for the initial puncture we have, as a rule, used the Floyd-Robinson puncture needle, but in some cases we have used the Shortle refill needle even for initial puncture.

Riviere (1) says:

> Pleural shock presents a series of symptoms which are generally indistinguishable from those caused by gas emboli. On this account difference of opinion as to the cause of symptoms arising in individual cases is bound to occur, and cases of embolism have probably been from time to time described under the heading of pleural shock. But in spite of this there seems no doubt that pleural shock is a reality, and the fact that it tends to repeat itself time and again in the same patient suffices to exclude embolism in a proportion of the cases.

Forlanini (2) says:

> It seems a peculiarity of pleural shock that it is apt to reappear at subsequent fillings, and even to get worse, and even to become fatal if treatment is persisted in.

Saugman (3) thinks that shock is greater where blunt instruments are used and is careful to avoid more than two punctures at the first operation.

Simon (4) says, "Symptoms of pleural shock resemble those of air embolism but are milder." He believes that shock follows the introduction of air below the body temperature.

Sachs reports twenty-six cases of pleural shock in the practice of American observers.

We have had four cases where patients appeared to be faint and had vasomotor constrictions, but as these were apparently mere fainting spells we feel that they cannot be considered as pleural shock, but more likely cocaine poisoning, the symptoms of which should not be lost sight of.

E. A. M., male, age twenty-three, admitted August 20, 1917. Previous history: Appendectomy two years before with discharging sinus one year. Imperfect union of muscle layers, resulting in hernia; otherwise negative. Present condition: Advanced case; left lung entirely involved with large râles on inspiration and expiration; cavity in upper third front. Right, a few râles after cough in upper third; temperature and pulse persistently high; 2 to 6 ounces purulent expectoration in twenty-four hours; very restless and nervous, would cry out in sleep every night.

October 22. 500 cc. of air injected into left pleural cavity.

October 27. Positive pressure; no gas given.

October 31. Unsuccessful, evidently pleural adhesions.

November 12. 700 cc. given.

December 1. 250 cc. given.

Throughout November and December the temperature was practically normal, pulse slightly elevated, but the nervousness continued.

On January 5, the patient came to the operating room acting nervous but not more than usual. An area in the seventh interspace at the angle of the scapula was anaesthetized and the usual cataract knife inserted in the needle track. A Shortle refill needle was then inserted and the manometer turned on. As there was no oscillation we were about to withdraw the needle but before we could do so the patient without warning sat upright on the table, rubbed his hand over his face, as if dazed, and sank back unconscious, with stertorous breathing, frothing at the mouth, and tonic contraction of the entire body. Nitroglycerine, 1/100 of a grain, was given under the tongue. Pulse good, pallor marked, pupils normal. Fifteen minutes later the tonic spasm disappeared and the patient acted delirious, throwing his body around, and shouting. Morphine, grain $\frac{1}{4}$, atropine, grain 1/150, were given by hypodermic injection. Patient talked irrationally, complained of pain all over.

January 5, patient's pulse good, temperature elevated, and he said he could not see; still irrational. January 6, patient still unable to see, temperature elevated, pulse normal, no muscular paralysis. January 7, patient could see, but remarked that every one looked as if they had false teeth. January 8, able to walk a short distance and except for a frontal headache, which he complained of all the time, he felt fairly good, conversation more rational. January 9, temperature practically normal, pulse normal, patient still nervous and with a far-off expression, but not suffering.

January 18, patient went home, still a little erratic in his actions and conversation, but not more so than previously.

We have seen no references in the literature to eye symptoms such as we have mentioned, which to us appeared more in the nature of a hysterical amblyopia, since there was for two days a complete loss of vision, followed by a gradual return. The pupilary reflexes were normal all the while, and no change could be detected in the fundi. There was a slight photophobia after the return of vision, and aching in the eye balls. Color perception was not tested. Vision was about normal when patient was discharged.

In considering this case we made the following observations:

1. That the shock occurred in a very nervous person.
2. That there was a diseased pleura.
3. That the shock occurred before air was injected into the tissues or cavity and came on very suddenly, after insertion of the needle, thus excluding the possibility of embolism.
4. That the shock followed the use of a sharp pointed instrument.
5. That the preventive treatment with morphine which has been recommended, also acted very well as a therapeutic measure.

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EDITORIAL

TOBACCO SMOKE AND PULMONARY TUBERCULOSIS[1]

This study (1) may strike many as having turned out "against the rule." But to some of us its results are not unexpected. Major Webb finds, in effect, that comparatively few non-smokers (only 27 per cent) have ronchi, while most smokers do exhibit these signs of chronic bronchial irritation, and cigarette-smoke inhalers almost invariably show them (83 per cent). He finds further that of a comparatively large body of young men (over 3000), the proportion that was discharged from active army service because of active tuberculosis was no higher among the smokers, the men who had ronchi, than among the non-smokers with relatively "quiet" chests.

Ronchi are indications of bronchial irritation and a consequent inflammation; and it might have been predicted that individuals who are habitually subjecting their respiratory tract to the far-from-soothing influence of cigarette smoke would be more likely to exhibit its effects, that is, inflammation, than those whose gaseous intake is confined to the more or less undefiled atmospheric air of town and country. This side of Major Webb's study represents, therefore, no startling discovery. But its other result—that the "ronchous" smoker's acquaintance with the tubercle bacillus is just as favorable and just as well guarded as that of his non-smoking neighbor—embodies certain implications that run so counter to what we have been taught and what we have comfortably believed, that it perhaps deserves a little more than a word of notice.

We were once told that in our struggle against the tubercle bacillus it was of great importance that we avoid anything that would bring about irritation of the respiratory tract. I believe that much of the anti-tuberculosis propaganda still recites that inflamed conditions of the nose, throat, larynx and bronchi lay us more open to tuberculous infection. The old admonitions had it that the inflammations brought about by the common cold, catarrh, tobacco, etc., left us in a "run down"

[1] Elaboration of remarks made in a discussion of a paper, "The Effect of the Inhalation of Cigarette Smoke on the Lungs. A Clinical Study," read by Major Gerald B. Webb before the Laennec Society of the Johns Hopkins Hospital, February 25, 1918.

condition and therefore comparatively defenseless against bacillary invasion. The idea undoubtedly had its birth in the long-noted and indisputable fact that the common cold and other catarrhal conditions were frequently followed by outbreaks of pulmonary tuberculosis. Therefore, the local inflammation was favorable and nourishing soil for the implantation of tubercle bacilli and a host of other microörganisms. This was a very natural presumption. For an inflamed tissue is a diseased tissue and without examining the matter more closely it seems reasonable to presuppose that a diseased tissue is more open to infection, —to bacterial implantation and invasion,—than a healthy tissue.

But let us analyze these matters further. In another place I (2) have already pointed out that it is at least debatable whether inflammation lends increased susceptibility to bacterial infection. Clinical data at once belie this assumption. If the proposition is maintained, then I would at once ask questions something as follows: Why are chronic leg ulcers so uncommonly the seat of acute bacterial infection? Why is erysipelas more often seen to arise in the healthy non-inflamed skin or in the clean, operative wound, than in the epithelioma ulcer or in the open patch of lupus where we should look for it? Why is a story of frank, acute bronchitis ushering in acute lobar pneumonia unusual?

In this connection too I have elsewhere called attention to what Opie (3) has to say on the function of inflammation. "Views concerning the nature of inflammation," he writes, "are widely diverse, but all are agreed that inflammation accomplishes the destruction and solution of a variety of substances, and notably those proteins which form the bodies of parasitic invaders." In the same lecture Opie cites experimental evidence as follows: "Pawlowsky has demonstrated the presence of staphylococci in the blood and organs of guinea pigs from twenty-four to forty-eight hours after inoculation of the knee-joint, but has been able to show that dissemination is inhibited or wholly prevented if before inoculation, acute inflammation of the joint has been produced by the injection of some sterile irritant such as turpentine, alcohol or solution of quinine." And again, "Issayeff . . . . . showed that the peritonitis induced by a variety of sterile irritants such as a foreign blood serum, bouillon, or normal salt solution, temporarily increases resistance to subsequent intraperitoneal inoculation of bacteria."

Now what does all this mean? It must at least suggest that inflammation is the visible expression of an animal organism's capacity to react to irritation whether the irritation be mechanical, chemical,

thermal; whether it be set up by organized or unorganized material; by inert or living substances, by grains of sand or bacterial parasites: and that this reacting capacity is a true resisting function of tissues. It is an effort on the part of tissue to defend itself, to limit the assault of the invader, to wall off the offending irritant. If this be true,—and to me it hardly admits of any doubt,—we must give up our ideas that inflamed tissues are especially favorable soil for bacterial invasion. They are the very reverse: they are points of unusual resistance.

It would be perfectly useless to speculate as to what element in the inflammatory process brings into the struggle the resisting units or substances;—as to whether the serum, or the leucocytes, or the new proliferation of fixed cells, renders the invaders impotent. That is material for studies of another nature. The point I want to make here is that the animal body interposes a something, a barrier, if you will, between itself and parasites that are trying to gain a foothold; and that the subsequent fate of the animal will depend largely on the competence and integrity of this barrier. In what this competence consists is another matter, that is not at present germane.

It is because of considerations like these that some of us have begun to doubt the soundness of the view that looks upon an inflamed spot as a *locus minoris resistentiae* for infection by microörganisms. But what we have to say applies only to the incident of *becoming infected*, not to what may or may not happen to a focus of infection that is already established.

It seems to me that it is not sufficiently well recognized, or, at least, not emphasized enough, that the factors that favor or prevent the implantation of an infection need not be at all similar to those that favor or prevent the spread of an infection, once it has taken place. This point is beautifully illustrated in an infection that tends to focalize like tuberculosis. In general we can say that relative stasis is favorable to infection but less likely to promote the spread of tubercle, while relative movement is likely to prevent localization of bacilli but more prone to spread tubercle once the bacilli have focalized; that is, other factors like the number of bacilli and the character of the respective tubercles being equal. We find therefore that infection of the lung with tubercle bacilli is much more common at the apex where movement (of lung, of air current and of lymphatic flow) is relatively small, than lower down and towards the front where movements are comparatively great. It is the rule for first infections to occur toward the tops and posterior

surfaces where movements are relatively restricted by less yielding structures, as compared with the more expansile front and bottom of the thoracic cage. Similarly, pleural adhesions are in general much more abundant and of much greater extent above and in back than in front and below; and when they do occur in front and below they are likely to be attached to the ribs which are more fixed than the intercostal spaces.

Now, though first infection prefers the top and back of the lung, the tubercle that results therefrom is much more likely to reach quiescence and arrest than if infection takes place in the more moveable parts of the lung. Even when tubercle formation has become extensive we become much more concerned about the formation of what we might call mid-pulmonary disease than about the same amount of apical disease. Clinical experience has taught us that in the former case we are dealing with a more serious condition than in the latter; and one of the reasons for this is that, as compared with relative inactivity, movement favors the mobilization and spread of focal products.

I have touched on this matter of the effects of movement and inactivity on two contrasting and different phases of tuberculosis, namely, infection and metastasis, because I want to protest against the confusion that usually involves any discussion of tuberculosis, when, as generally happens, it is assumed that what holds good in reference to the taking place of infection also holds as concerns its further development and spread, and when, as so often happens, the factors that govern therapy are mixed up or made identical with those that relate to prophylaxis. And I am further desirous of pointing out how inflammation can have two very different effects, depending on whether it is concerned with implantation of bacilli or an action on a focus already present.

As regards implantation, my argument has already laid it down that microörganisms that are brought to a tissue that is already inflamed fall on relatively resistant soil. But as regards the further development and spread of an already established focus, inflammation can exert an effect that may not be so favorable. Tubercle anywhere in the body is benign or innocuous just so long as its investing envelope is of such a nature that it is so impervious to the circulation of tissue juices that goes on between it and the host that the maximum amount of material absorbed is not enough to produce symptoms of intoxication in the host and the maximum of the kinetic energy of the circulation is not sufficient to mobilize bacilli and spread them. As sclerosis of tubercle proceeds

the interior of the formation becomes more and more shut off from the surrounding tissues. Now anything that can bring about a better circulation around this avascular structure, anything that will promote an enhanced give and take between it and the surrounding tissue, will tend to "unlock" or "open up" this walled-in structure. Among other things this is exactly what inflammation—hyperaemia, congestion, etc.,—can do and frequently does do. And when it does this then inflammation becomes a contributory and inciting factor to the development of tuberculosis: not, remember, to infection with tubercle, but to the spread of tubercle, or the development of tuberculosis. Here then we can look upon inflammation as we viewed movement,—as capable of exerting two very different and antithetical effects, depending on whether we are considering either of two very different phases of what in the large is one problem.

Let us come back now to Major Webb's paper and the immediate questions that its subject matter raises. Major Webb finds that men with bronchi in a state of chronic inflammation do not develop the disease tuberculosis in larger proportions than men with what might be called more normal bronchi. The older view was that inflammations of the respiratory tract do predispose to tuberculosis, and I believe that many assumed that this predisposition was a predisposition to infection. To-day, with our newer knowledge of the relative incidence of infection and morbidity, few of us, even without going into the matter further, would believe that, if men with inflamed throats and bronchi fell ill with tuberculosis, this disease was the result of recent infection. We should be more inclined to believe that the disease represented the awakening of old quiescent tubercle, planted perhaps years before. Therefore, on this basis alone, we should say that irritation of the upper respiratory tract in an adult played no part in infection. But we have in addition pointed out that inflammation, if it does anything, probably resists a fresh infection.

Now if it were granted that inflammation does not lay a tissue more open to infection, but that on the contrary it probably plays a part in resisting bacterial invasion, it still remains for us to consider what effect constant irritation, brought about perhaps by some such stimulus as tobacco smoke, might have on foci of tubercle that exist in tissue. This set of circumstances would no doubt represent what more likely occurs under natural conditions; that is, some tubercle is already present in the lungs of individuals who take up the smoking and inhaling habit,

and it is this tubercle that later blazes out into clinical disease and again therefore it is this tubercle on which the inhaled cigarette smoke exerts an effect.

It will immediately occur to everyone that if nearly everybody has quiescent tubercle and if inflammation can exert an awakening influence on such dormant tubercle and if frequently the ultimate result of the inhalation of cigarette smoke is a chronic bronchial inflammation, then why do not more cigarette inhalers develop tuberculosis? The answer is that the factors are not so simple as this qualitative statement of the problem. To go a little further we must deal with the quantitative phases of the situation.

It is not to be doubted that while just enough and perhaps too much inflammation is bad for a tubercle, a little bit of inflammation either exerts no deleterious effect on it, or may, indeed, be good for it. We see this exquisitely exemplified in studying the influence of tuberculin on *focal* tubercle. All of you are aware that if sufficient tuberculin gets to a focus of tubercle it will cause the latter to react with inflammation. If now the focus is not too large, is not too much of the nature of a diffuse process and is well enough invested to begin with, and if the inflammation is not too intense, we may observe (at least, experimentally) the most amazing results to follow the focal reaction, that is, inflammation. In a short time such a focus that may have persisted for weeks and months may disappear like snow before the summer sun, while non-reacted, non-inflamed foci in control animals go on to necrosis and dissemination. But too violent an inflammation in too acute a patch of tubercle can cause irreparable damage from the tissue death and spread of the process that it can bring about.

In the tobacco smoke inhaler we have a comparatively mild irritation, repeated often over a long period. What results is likely to be a chronic inflammation of a low grade. Everything else being equal, its net effects on tubercle that is otherwise being well taken care of should be mildly "stimulating" and tending to repair; not violently upsetting, as might occur from a lobar pneumonia in the area surrounding the tubercle. We should expect, therefore, that a number of divergent and perhaps opposing factors would balance one another, and that, as compared with one thousand non-smokers, a thousand smokers would reach equilibrium.

What I have said applies only to the local irritating effect of tobacco smoke. This effect is to be kept altogether dissociated from any dis-

cussion of the constitutional effects of tobacco. Constitutional effects, such as the influence of tobacco on digestion, on the nervous system, on the vascular system, on the psyche, undoubtedly come into play and would have to be reckoned with in any broader discussion of the influence of the use of tobacco on the development of tuberculosis in general.

A. K. K.

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THE TUBERCULOSIS PROBLEM: ONE POINT OF VIEW

Volume xxxiii of the *Transactions of the American Climatological and Clinical Association* has just come in. We note the interesting questions that were brought before the society by Bracken of Minneapolis. One individual reaction to these questions is represented in the following answers:

1. *Can the danger from an open case of tuberculosis be considered negligible so long as there are no small children associated in residence with said patient?*

It is unsound policy to consider something as a *danger*, for which there is not the slightest statistical or other evidence. It is absolutely erroneous to confuse infective possibility with disease-producing probability and especially to disregard the fact that (without any interference) the general resistance against tuberculosis is constantly increasing in populations of our race.

With proper education and especially by an insurance of healthy material conditions in such families, cohabitation is preferable to the dispersion of familial elements.

2. *Is it to be admitted that the infection of adults with tuberculosis can be considered a negligible quantity?*

It *must* be so considered, for since we can never know anything about the time and place of such infection, we simply waste our time by speculating about it. On the other hand we can know and do know something of the factors which transform a theoretical infection into a practical disturbance and it therefore must be unsound policy to pay undue attention to adult infectibility and to treat the determining factors in a perfunctory manner.

3. *Given the case of a babe that has been living with a tuberculous mother under conditions permitting possible infection of child before the condition of the mother is known: What course should we follow with the child? Shall we assume that it is already infected from the mother and that therefore no action need be taken looking to its possible future infection from the mother?*

Here again the disease-producing factors, which are of the only practical importance, are subordinated to the theoretical possibility of infection which cannot determine anything. The answer to this question therefore must be in the sense of that to question 1.

4. *How do so many children become infected with tuberculosis in infancy, when but a very small percentage come in contact with open cases of tuberculosis?*

The fact is that we know nothing about the genesis of infantile gland and bone tuberculosis from the standpoint of infection. But we know a great deal and we might know much more if our search were not constantly disturbed by the postulate of specific infection, about the factors which produce readily curable (unopened) foci and obstinate progressive (opened) sores, which however from a practical point of view have no other relation to pulmonary tuberculosis, than has the vaccination sore to general variola.

5. *Is tuberculosis a public health problem?*

It is, but it does not present a *special* problem that can be met by special measures. Public health depends on any and every factor which involves the vitality and resistance of a group of people. For purposes of study it is necessary to analyze single factors for themselves. But it is absolutely vicious practice to base public health efforts exclusively or prominently on artificially circumscribed findings only because they happen to have yielded abundant experimental results and not because their practical importance is demonstrated. The latter can only be done scientifically when the other factors are equally penetrated by methods which have yet to be devised. Up to that time the only sound policy can be to consider the tuberculosis problem as submerged in the larger problem.

6. *Should every case of tuberculosis be reported?*

No, because it would not even have a theoretical value. At our present state of knowledge only cases could be reported which are either infected or suspected to be infected. And since the fact of infection is of slight practical importance the measure of reporting would provoke merely an intrusion into private affairs without any adequate compensation to the collectivity.

7. *Should there be sanitary supervision of every case of tuberculosis?*

As this is dependent on the foregoing the answer obviously has to be negative. In general the principle of compulsory supervision in tuberculosis does not seem sound. The state has no right to exert such supervision unless it *provides* for each individual the material basis for a happy and healthy life.

8. *Has the sanitorium a place in the control of tuberculosis?*

Institutional provision undoubtedly is of importance in the maintenance of public health. How far such provision is to be specialized will merit careful consideration. The present system does not offer the most satisfactory solution and a reformation on a broader basis is highly desirable. See my

discussion of the subject in Tri-State M. J. and Pract., St. Louis, 1897, iv, 204; in St. Paul M. J., 1903, v, 125, and especially, ibidem, 1907, ix, 226; and U. S. Naval Med. Bull., 1917, xi, 21.

9. *Should all tuberculous patients be sent to an institution (sanatorium or hospital) for the tuberculous?*

The question should rather be: If it were possible would the probable result justify the means? Although purely academic this question could elicit only a negative reply because even within our limited experience the concrete results are by no means satisfactory.

10. *Should all open cases of tuberculosis be compelled to stay in an institution (sanatorium or hospital) for the tuberculous?*

The principle of compulsion having already been dealt with in my answer to question 7, only the desirability of such a measure remains to be considered. And this again is purely academic for not "all open cases" could be made accessible if for no other reason than that we do not even know what constitutes an "open case." Your question 4 alone makes this clear.

11. *What should be done with the incorrigible tuberculous?*

I presume by "incorrigible" is meant the indiscriminate spitter, the drunkard, the filthy, etc. They belong to the large class of the socially irresponsible and have to be dealt with by disciplinary methods, *but not because they are tuberculous.* A state without order is unthinkable, but the enforcement of order must be based on broad hygienic, ethical and legal principles, not on isolated scientific theories which are constantly subject to change with increasing knowledge.

12. *Why disinfection after tuberculosis?*

Because of the current bacteriologic bias, and the consequent neglect of other equally or more important factors. It is harmful because it induces a state of indifference toward measures for continuous cleanliness which in the aggregate have been far more powerful in the prevention of disease in the modern commonwealth than any specifically antiseptic procedures, both voluntary or obligatory.

CONCLUSION

That the above questions were asked at all shows how little the light we hailed thirty-six years ago has helped us to penetrate the darkness. The very brilliancy seems to have cast deeper shadows. We are rubbing our eyes: we detect forms moving in the shade.

We see the grim mass of enemies attacking public health. We realize how they succor each other, how futile our resistance if we see but one and not the whole grim mass. We have employed tactical measures only in both the defensive and offensive. We have lacked coördinated action, strategy.

Against one of these foes, tuberculosis, we have formed a strong tactical organization, the National Association. From it might well issue the broader effort. It must bring about the *liaison* between the various tactical units so as to control them eventually, to prevent duplication of effort, waste, confusion. We have agencies dealing with nervous and psychic ailments, with syphilis and alcoholism, with poverty, etc. They not only ignore each other, nay they antagonize each other, for each believes itself to be the champion of the worthier, weightier cause. They need to be brought to a focus. A Committee on Coöperative Policy might well be organized at once and report at the June meeting.

ARNOLD C. KLEBS.

MEDICAL NOTES, ABSTRACTS AND REVIEWS

It will be the eventual purpose of the REVIEW thoroughly to canvass all literature on tuberculosis as it appears in other medical periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the Abstract Editor, Dr. George Mannheimer, 41 West 51st Street, New York, N. Y.

Blood Calcium.—The total blood of a 60 kgm. man contains about 0.3 gram of calcium. The bones contain approximately 4000 times as much. With this great reserve supply of calcium, a portion of which is available, as is indicated by the great constancy of blood calcium under varying diets and conditions, a physiologic basis for the administration of calcium salts in tuberculosis has yet to be demonstrated.

Determination of the calcium content of the blood of 30 patients with advancing and convalescing tuberculosis revealed that in the incipient cases in which the patients, who were on a high milk diet, showed marked improvement, the values for calcium, in the serum were normal and fairly constant. In no case was the calcium value increased above normal figures by this high calcium diet. In advanced cases the variations obtained were greater (some rather high and some rather low values being obtained), and improving patients showed on the average slightly higher values than the unimproved. No marked deviations from the normal, however, were observed in the calcium content of the serum of patients in the various stages of pulmonary tuberculosis.

The failure of the body to deposit lime around the tuberculous areas is to be ascribed, not to a deficiency in blood calcium, but rather to an inability of the cells of the tuberculous area properly to utilize available calcium.—*Calcium in the Blood in Tuberculosis, J. O. Halverson, H. K. Mohler, and Olaf Bergeim, J. Am. M. Ass., May 5, 1917, lxviii, No. 18, 1308.*

Blood Picture in the Prognosis and Treatment of Tuberculosis.—Examination of the blood should form part in the care of the tuberculous patient. Fifty cases were studied, with the following conclusions. The Arneth index or the lymphocyte count alone are of small value, but they offer valuable help in prognosis when considered together. Occasionally, upon the first examination, the physical findings and blood picture do not agree. The progress of such cases usually conforms to the blood picture. It would seem that the blood picture might be of considerable value in the treatment of tuberculosis by giving us a more definite indication of a patient's reaction to tuberculin, heliotherapy, exercise, etc. A high lymphocyte count is a favorable prognostic index.

The 50 cases studied were divided into 3 classes: (1) progressing unfavorably or unimproved, (2) improved, (3) apparently arrested. The following are the results: class (1) Unimproved; average Arneth index 72, average lymphocytes 24 per cent, 15 cases. (2) Improved; average Arneth index 64, average lymphocytes 31 per cent, 19 cases. (3) Apparently arrested; average Arneth index 57, average lymphocytes 36 per cent, 16 cases.—*The Blood Picture as an Aid to Prognosis and Treatment in Tuberculosis, R. E. Thomas, Southwest Med., October, 1917, 1, No. 10, 9.*

Treatment of Tuberculosis.—All cases of tuberculosis imply a lowered body resistance and it is therefore not sufficient to prescribe fresh air, food and rest but we must find out what factors in the personal life and environment of the patient are at fault and lend our energies to correct them. Among conditions which retarded improvement of tuberculous patients in spite of ideal hygienic conditions have been found the following: chronic appendicitis, chronic alveolar abscess, chronically infected tonsils, indigestion, infected gall bladder, various mental and nervous conditions as worry, nostalgia, introspection, and incompatibility of nurse, friends, or doctor.

The plan of indiscriminate feeding up of patients has so frequently proved harmful that phthisiologists are pretty well agreed that, if the patient's weight is up to, or a little above, the average for his height, he

will receive no benefit from more than an ordinary liberal diet. One must see that the digestion is equal to the demands made on it. If stuffing is needed it is desirable to have it done intermittently, perhaps four or five days a week. Occasionally a person seems to be benefited from a day of partial fasting or from a few days of diet limited largely to liquids. The diminution in stomach acidity and motility in advanced tuberculosis is benefited by the administration of hydrochloric acid. More attention should be paid to the improvement in elimination through the bowels, kidneys and skin. This will rid the system of toxins and reduce or avoid the occurrence of bilious attacks, night sweats, fever, anorexia and weakness. The out door life must be made comfortable and agreeable to the patient. The amount of exercise advisable for each individual patient should be based upon a preliminary observation of the patient at rest. An attitude of cheerfulness, hope and contentment is essential. An intelligent patient should be taught enough about his disease to help him to do his part in the work of the team composed of the doctor, nurse or family and himself, he being the leading factor. Exposure to the sun, in the open air, over gradually increased areas of the body and for gradually prolonged time till the whole body (except the head and neck) is exposed for one to three hours is one of the most valuable measures in the treatment. The exposure should be stopped short of nausea, faintness, profuse sweating, or rise in temperature. Artificial pneumothorax should be considered in cases that get progressively worse in spite of intelligent and faithful treatment. While it is most beneficial in unilateral cases, improvement has been obtained on the side opposite to the one compressed owing to lessened toxemia. The X-ray is valuable, before resorting to this treatment, for the detection of the presence of adhesions and their location in order to facilitate compression. In very active cases tuberculin should not be employed. Cough is an essential means of free expectoration, but unproductive cough is distressing to the patient and should be relieved. Often the cough is caused by irritation in the throat, at other times it is a habit and should be stopped by persuasion. It is advisable to teach patients to cough at the end of expiration instead of at the end of inspiration. This shakes up the lung less and expectoration is not interfered with by the procedure.—*Treatment of Tuberculosis, W. H. Swan, Northwest Med., December, 1917, xvi, No. 12, 365.*

Treatment of Tuberculosis by a Bacillus-Destroying Compound.—A compound composed of two drugs, echinacea angustifolia and inula helenium, has been used by the author in the treatment of all forms of tuberculosis. The value of this compound lies in its ability to bring about a chemical disintegration of the lipoid envelope of the tubercle bacillus and its ultimate destruction. The reactions following intravenous, and to a lesser extent intramuscular, injection of the compound are: (a): Immediate—increased respiratory and pulse rate, slight rise in temperature, and flushing of the face. (b) Subsequent—increased cough and copious expectoration. (c) General untoward reactions—Rise in temperature of more than 1 degree, dryness of the air passages, swelling of the lips and forehead, redness and itching of the body, and profuse cough and expectoration. These reactions are only present in far advanced cases, and patients manifesting them should receive no further injections.

Fifteen guinea pigs were inoculated with tuberculous sputum. Of these 14 showed the characteristic symptoms of tuberculosis. The disease was arrested in 10 of the 14 animals treated with the injections, the dose varying from 2 to 5 cc. The 4 remaining animals died. More than 200 cases of tuberculosis were treated with the compound. Of 4 glandular cases 2 were arrested, the others showed no improvement. In incipient tuberculosis 100 per cent recoveries were obtained. Of moderately advanced cases 50 per cent were arrested. Profoundly intoxicated and far advanced cases yielded no results. In curable cases arrest of the disease had been obtained in from four weeks to eighteen months.

Night sweats were controlled in the majority of patients, hemoptysis was favorably influenced, and the cough and expectoration were both diminished. The general order of sequence in the cessation of signs and symptoms is: There is first a reduction in the temperature and the pulse rate to normal or near normal; then the cough and expectoration are diminished, and the Arneth's count returns to normal. Phagocytosis is found to be active, and the body weight increases. The sputum becomes negative after an average of from three to five months. The last to clear up are the pulmonary physical signs. As a rule response to the treatment can be gauged by the Arneth count. Whenever the count continues favorable, the case will recover, unless complications set in. Whenever there is no improvement in the Arneth count after two months of intensive treatment, the case may be considered hopeless.

In joint and bone cases the compound was applied locally, which was followed by a restoration of motion and decrease of the swelling. Sinuses when present gradually

healed. Intravenous or intramuscular injections were made at the same time. Five genito-urinary cases received urethral and vesical injections of the diluted compound, together with the usual intravenous dose. Of these four recovered, and the fifth died.

Conclusions.—The "T-E compound" destroys tubercle bacilli, increases phagocytosis, reduces temperature, assists in the elimination of toxins, controls night sweats, increases appetite, and effects an arrest of the disease or a clinical cure, in virtually all incipient and in about 50 per cent of the moderately advanced cases. In far advanced it has no appreciable effect.—*Results of Treatment of Tuberculosis by Means of a Bacillus-Destroying Compound, V. Von Unruh, Med. Rec., November 17, 1917, xcii, No. 20, 847.*

Iodine in the Treatment of Phthisis.—Joblins and Petersen, when making investigations at the Rockefeller Institute, found that soaps of the unsaturated fatty acids were capable of inhibiting the action of trypsin and other ferments, and furthermore they discovered in tubercle bacilli a ferment-inhibiting substance of the nature of a lipoid, to which they attribute the lack of autolysis and consequent caseation in tuberculosis. In addition, they found the higher the iodine value of a soap the less was its activity as an inhibiting agent, while saturation with iodine would destroy entirely its inhibiting powers. Moreover, in a further study these same investigators demonstrated that ether-soluble substances of the bacilli, which constitute from 25 to 35 per cent of their weight, and which are largely composed of fatty acids, have a marked restraining action on trypsin.

Dr. E. Curtin, writing in the *Medical Press*, November 14, 1917, draws attention to the above investigations and points out their significance. Iodine counteracts and nhibits the lipoid element, which acts as an antiferment. The effect of iodine is supposed to be due to a saturation of the unsaturated bonds of the fatty acids of the lipoids, rendering the substituted product less active as an antipyretic agent. It also reduces the surface tension of the phagocyte and increases phagocytosis. According to Curtin, Dr. Crofton of Dublin has shown that iodine attacks the toxin of the microbe, turning it into a toxoid, and this facilitates the digestion of the microbe.

The conclusions drawn by the author are as follows: (1) The ferment-inhibiting action of the tubercle bacillus is due to the presence of unsaturated fatty acids. (2) These fatty acid compounds can be removed by means of ether. (3) Iodine and iodide of potassium remove or modify the inhibiting action of tubercle bacilli. Curtin points out the above observations confirm and justify the treatment of phthisis by the intravenous injection of iodoform dissolved in ether, a treatment employed by him with, he claims, unvarying success during a period of nearly six years.—*Editorial, Med. Rec., January 19, 1918, xciii, No. 3, 113.*

Treatment of Tuberculosis with Copper and Potassium Cyanide.—The value of copper and potassium cyanide was tried by the author in ten cases, chosen without much regard to their severity. Careful records were kept of the blood, urine, sputum, etc. The Wassermann test was negative in all but one case; the sputum was positive in all. The preparation was given intravenously in doses varying from 8 to 21 mgm., at intervals of two weeks. The patients were confined to bed during the first week following each injection; some of them during the entire course of treatment. The general reaction was slight. Five cases had moderate chills. Rise in temperature was unusual. Two cases had an increase in pulse rate, one had arrhythmia. Other evidence of general reaction was rare. Focal reaction was present in all cases. All showed increased râles, a majority an increased cough. No definite results were obtained as to the bacillary content of sputum. Pleural pain was present in most cases. None had demonstrable pleural effusion except one. All of the patients except one with whom the prognosis was bad at the start, claimed to be improved. This subjective improvement did not correspond with the physical findings. Copper and potassium cyanide in doses from 8 to 12 mgm. in uncomplicated pulmonary tuberculosis is not followed by injurious results. Large doses, or even smaller ones in complicated cases or those presenting extensive active lesions may produce serious focal reactions causing permanent harm. Severe hemorrhages are not likely to occur. The preparation is not very irritating to the perivascular tissues. Its value in the treatment of pulmonary tuberculosis has not been conclusively demonstrated. Its further trial is justified.—*A Critical Analsis of the Treatment of Tuberculosis with Copper and Potassium Cyanide, G. H. Evans, Med. Rec., October 6, 1917, xcii, No. 14, 575.*

Roentgenotherapy of Tuberculous Peritonitis.—Of all the various methods of treating tuberculous peritonitis that have been applied to date, systematic utilization of sunlight and sea air seem to have the most testimony in their favor. But both require the suitable environment which is within the

reach of comparatively few. On the other hand, with the roentgen rays we can appy the chemical rays anywhere, even to outpatients. Weil has been applying roentgenotherapy systematically since 1914, using large doses of very penetrating rays, filtered. Some of the children had the fibrous form of peritonitis and some the form with ascites. In every case in which there was not already generalization of the disease in the lungs or pronounced cachexia, a complete cure was rapidly realized, with complete restoration of the general health. He uses a Coolidge tube, a 5 mm. aluminum filter, a 20 cm. spark, and a 1.5 or 2 milliampere current. The exposures are repeated about monthly, but he reduces the strength a little each time to ward off skin trouble. This technic does not entail radiodermatitis nor generalization of the tuberculosis. After the first series there may be a recrudescence of the fever and persisting malaise, but this reaction was never serious in his experience, and he never allowed it to intefere with his giving the effectual dose of 12 or 14 H units in the course of four successive days on the four quarters of the abdomen. In case of much debility the series can be fractioned to spread out over ten or twelve days.—*Radiotherapie de la péritonite tuberculeuse, E. Albert Weil, Paris Méd., October 13, 1917, vii, No. 41, 292.*

Heliotherapy and Pigmentation.—Jeanneret and Messerli have made a systematic study of the tanning of the children taking courses of heliotherapy at a mountain sanatorium, 200, 720 and 800 children during the last three years respectively. They give a colored plate showing ten different tints in tanning, and urge that this plate be pasted on cardboard or a sheet of metal to serve as the standard pigmentometer. The pigmentation seems to be a normal phenomenon of a defensive reaction. It depends on the proportion of hemoglobin in the blood, hence is an index of the general assistance of which the organism is capable, and its power of reacting to the heliotherapy. Premature subsidence of the tan is a sign that the hemoglobin supply is giving out. Tuberculosis is the disease, above all others, which intoxicates the organism with the autogenous tuberculin and thus drags down the hemoglobin percentage. This secondary anemia is revealed in the depigmentation of the tanned children. Hence the tanning and the depigmentation are important both for diagnosis, prognosis and treatment. There must be an ample hemoglobin supply for the child to tan normally and to keep its tanning after cessation of the course of heliotherapy. This assumption is based on the findings in hundreds of cases observed over years and compared with the clinical course. The sun bath acts on the skin first of all, stimulating the peripheral circulation and thus nourishing the muscles, vivifying the blood and increasing the hemoglobin percentage. This effect is so constant that sunlight is evidently the ideal remedy for debility in children, especially when associated with proper physical training. This action on cellular metabolism seems to be the whole secret of the success of heliotherapy in certain chronic affections, thanks to its stimulation of the processes which induce immunity. This explains the advantage of preventive heliotherapy against tuberculosis, such as Jeanneret has long been advocating. In non-infected children, adult and animals, the sun does not stimulate the processes of immunity as there is nothing to start them with. Although the general resistance may be superb, as in Australian natives and in the cattle of the Hungarian plains, constantly in the sunlight, yet infection once installed is liable to run a peculiarly malignant course, owing to the total lack of tuberculosis in their native environment. But in children already infected, the sunlight hastens and intensifies the protecting immunity processes already under way, and aids the organism in keeping the infection down and crushing it out.

Month after month during these three years they have witnessed how progressing tuberculous glands pass into a torpid phase—the test of victory over the primary infective tuberculosis; slight lesions in the lungs heal; and children who have been coughing all winter pass through the winters after their course of heliotherapy without "colds" of any kind. The beneficial action of the sunlight is equally effectual in the lowlands, in the mountains and at the seashore—the only difference is the number of days of sunshine. The proportion of ultraviolet rays was found by Berthelot to be approximately the same on the summit of Mont Blanc, on the shore of the Mediterranean and on the plains of France. When well tanned healthy children develop an acute infectious disease, they bleach out rapidly. The children that tanned rapidly and retained their pigmentation till spring were the healthiest ones. Among sixty-one children with slightly febrile tuberculous processes, four showed marked bleaching after four rainy days while no modification was evident in the 470 children of the other groups.—*Héliothérapie et Pigmentation, L. Jeanneret and F. Messerli, Rev. Méd. de la Suisse Rom., November, 1917, xxxvii, No. 11, 668.*

An Antituberculosis Serum.—The ability of a specific virus to produce immunity is

due to the non-specific proteins present. Since non-specific proteins are able to cure a specific disease, and the cure can be accomplished only by providing all the elements of the animal body with amboceptors and antibodies, according to Wright, we may draw the conclusion, that a non-specific protein is able to produce in the animal body a specific antibody. After a study of ten different species of tubercle bacilli found in gland and bone tuberculosis, the author has chosen one which seemed to be the strongest on account of its rapid and luxuriant growth on glycerin agar. Large doses of the bacilli injected into guinea-pigs produced no bad effects. A serum produced from this bacillus, designated as Bacillus X, was tested for its efficiency on tuberculous animals. The goat was used as the medium. Three animals were selected and their blood prior to inoculation with Bacillus X tested for complement fixation with the following organisms: tubercle bacillus, Bacillus X, syphilitic virus, staphylococcus, gonococcus, and coli communis. All were negative except the last, which was slightly positive in one goat. The normal goat's serum was also tested on guinea pigs for any retarding action on tuberculosis lesions and found negative. After injecting Bacillus X for nine months, the author obtained positive complement fixation with tubercle bacilli and with Miller's and Craig's antigens. The precipitation and agglutination tests were also positive. The goat serum obtained after nine months' injection with Bacillus X, was administered to guinea-pigs and its effect on the course of experimentally produced tuberculosis studied. The results showed that guinea-pigs treated with serum prior to inoculation with tubercle bacilli will resist infection better than those not previously so treated. The larger the amount of serum given and the greater the number of doses, the stronger the protection. The longer the administration of the immune serum was delayed, the shorter the protection. The serum offers slight if any protection to animals with fully developed tuberculous processes. Fresh serum is the most efficient, and after four months, the serum is not dependable.

Sixteen patients, comprising eight pulmonary and eight surgical cases were subjected to treatment with the serum. The amount injected varied from 2 to 24 cc. the injection being made intramuscularly. No local and slight general reactions occurred. In one case where the injection was given subcutaneously, however, lymphangitis and swelling took place. Focal reactions were mild and subsided as healing was accomplished. The injections were given every seven to ten days depending upon when the ensuing improvement came to an end. All patients—with one exception—improved and those who persevered with the treatment were ultimately cured. One pulmonary case with cavitation, however, who had previously been treated with tuberculin, showed no improvement. Some patients, in spite of improvement, still had bacilli in the sputum. This leads the author to believe that the action of the serum is directed against the toxins, neutralizing them, while at the same time preventing multiplication of the bacilli.—*Report of Experimental Work in the Production of an Antituberculosis Serum, Max Staller, N. York M. J., December 22, 1917; cvi, No. 25 and December 29, 1917; cvi, No. 26, pp, 1166 and 1219.*

Serovaccine for Tuberculosis.—Shiga has been working for years to perfect a serovaccine made from living tubercle bacilli rendered avirulent by being treated with flavin, iodeosin or erythrosin, or more than one stain. The serovaccines are more readily absorbed than ordinary vaccines, and they induce a milder reaction while immunization proceeds more rapidly and surely. Shiga's report is in German, and reviews the various steps of his research in this line under Ehrlich and since his return to Japan, his experimental research and the clinical application of the serovaccine. Its chief advantage is that, while avirulent, it yet contains all the antigens of the tubercle bacilli —*Serovaccine from Avirulent Living Tubercle Bacilli, K. Shiga, Kitasato Arch. of Exper. M., November, 1917, L. No. 2, 157.*

Onions in Tuberculosis.—Experiments were conducted with the object in view of explodiug the erroneous practice of using onions as a therapeutic agent in tuberculosis. The attempt was made to feed onions to healthy guinea-pigs and to those previously inoculated with tubercle bacilli. The guinea-pigs absolutely refused to eat onions. preferring to die rather than eat them. Therefore hyperdermic injections of various onion preparations were resorted to. First healthy pigs were injected to study the effect of onions on normal tissues. Then a series was injected with varying doses of tubercle bacilli for control. Another series which had received the different onion preparations was injected with tubercle bacilli to see whether onions have any prophylactic properties against the tubercle bacilli. A further series received the bacilli and onion preparations together to see whether onions destroyed or attenuated tubercle bacilli. Lastly some pigs received tubercle bacilli and sometime later the onion preparations to see whether onions contained any curative

properties affecting the tubercle. The results were all negative. The onion does not affect the normal tissue of the guinea-pig. It will not prevent the development of tuberculosis; it will not destroy or even attentuate the tubercle bacilli; and it has no curative properties in tuberculosis.—*Onions in Tuberculosis, W. Lintz, N. York M. J., October 13, 1917, cvi, No. 15, 683.*

Reaction to Altitude.—Twichell has observed tuberculous patients at various altitudes: at Saranac Lake (1700 feet), at sea-level in Lower California, and in New Mexico at 6000 feet. Upon removal of a tuberculous patient from low to high altitude the following changes take place: the red blood corpuscles are increased in number, the increase being absolute but probably only temporary; there is an actual increase in the hemoglobin, as well as in the number of the mononuclear lymphocytes and the platelets. Regarding any possible change in blood pressure, the point is not fully settled. The cough, expectoration and fever are not strikingly altered; the weight depends on the mode of treatment, especially feeding and rest. Chronic cases may not gain much or lose slightly while improving clinically otherwise. Night sweats are rare at high altitudes even in advanced cases, though there may be some night-sweats during the first few days on arrival. Hemorrhage from the lungs seems to be rarer. The same is true of pleurisy with effusion. Regarding the loss of tubercle bacilli from the sputum the author compares the figures of 200 patients at Saranac with 78 at Silver City, N. M. The former, with an altitude of 1700 and a large percentage of early cases, showed 7 per cent loss of bacilli in one year; the latter, at 6000 feet with a large percentage of advanced cases, showed 10 per cent loss in the same period of time. The humidity in the former is high; in the latter, low.

Far advanced cases, on reaching a high altitude, may suffer a reaction due to increased toxemia which is apt to hasten a fatal end. A less serious reaction may take place in less advanced cases, consisting of dyspnea, cough, expectoration, cyanosis and oozing of blood in hemorrhage cases. Some cases will show a reaction after the lapse of some time on arrival consisting of: high fever, rapid pulse, nervousness with insomnia and even signs of cerebral irritation. These usually subside in a few days when the patients commence to improve. The increased work of the muscles of the chest and neck incident to residence in a rarified atmosphere, with the resultant increase in the flow of blood and lymph is probably the cause of these reactions owing to the washing out of toxins and the stimulation of the formation of antibodies. Low humidity has a stimulating effect on the excretory functions of the skin. Together with the action of the sun's rays, it has a great beneficial effect on tuberculous lesions without the harmful results which often follow exposure to the sun in regions of high humidity.—*Reactions to Altitudes in the Tuberculous, D. C. Twichell, Am. J. Med. Sc., December, 1917; cliv, No. 6, 827.*

Artificial Pneumothorax.—Artificial pneumothorax was attempted in 53 cases at the State Tuberculosis Sanatorium, Carlsbad, Texas. Twenty-six were advanced, 14 moderately advanced, and 13 were hemorrhage cases. In 2 patients, both advanced cases, the process was apparently arrested, while in 4 moderately advanced cases the disease became quiescent. Ten were improved and are still under treatment, and in 7 hemorrhage cases the injections were stopped because the hemorrhage ceased. Four patients left the institution improved, to continue treatment elsewhere; 5 left unimproved. In 4 cases the use of artificial pneumothorax was stopped because of active trouble developing in the opposite lung, or for other reasons.

Hemorrhage can be treated by lung compression with best results, if not continued after bleeding is controlled in bilateral cases. The opposite lung must be carefully watched, while in addition, the patient should be under the closest supervision, preferably in a sanatorium. Ulcerative cases promise the best results, and if a patient is doing well, inflation should not be undertaken. The best results follow the frequent inflations with small amounts of air in cases where the opposite lung is well or has an apparently healed lesion.—*Artificial Pneumothorax, H. E. Gammons, Boston M. and S. J., January 17, 1918, clxxviii, No. 3, 90.*

Intraspinal Injection of Air in Tuberculous Meningitis.—Ramond and François reiterate that tuberculosis is essentially curable, especially when it involves serous membranes, and their experience during the last two years with injection of air seems to suggest that this treatment has a future. It has been found useful in tuberculous peritonitis and pleurisy, by various workers, and Ramond has found it effectual also in arthritis, orchitis and meningitis. The procedure seems to be absolutely harmless by this technic: The lumbar puncture is done on the reclining patient and about 40 cc. of fluid is withdrawn. The air is drawn into a Roux syringe through a long, red hot platinum needle which sterilizes and

warms it and is then slowly injected through the puncture needle which had been left in place. The amount of air injected should not be over one-half or two-thirds of the amount of fluid withdrawn. The injection of air can be repeated for five or six consecutive days but no longer, as the nitrogen in the air is not readily absorbed; if oxygen is used, instead of air, it can be kept up indefinitely. The results obtained with this treatment in tuberculous meningitis have been encouraging, but the patients all died finally, after a period of improvement. He reports here the case of a young man in coma in which the improvement for two weeks was so striking that complete recovery seemed inevitable. The tenth day after suspension of the air injections the patient, a soldier of twenty-five, became unconscious and died in three days. It is possible if the injections of air were made at once, as soon as the diagnosis is established, they would prevent the extension of the tuberculous process, especially if the air were injected into the lateral ventricles. Experience has confirmed the tolerance of the ventricles for injected air. In future Ramond will inject more air; the amounts hitherto used, from 2 to 15 cc. were probably too small.—*Traitement de la méningite tuberculeusepar les injections intrarachidiennes d' air sterilisé, F. Ramond and François, Bull. and Mém. de la Soc. Méd. des Hosp. de Paris, November 15, 1917, No. 29-30, 1058.*

Treatment of Tuberculosis of the Spine.—Tuberculosis of the spine is treated by a prolonged period of recumbency in the open air and sunshine. By such treatment the picture of misery is changed in a short time to one of happiness and health. The children are placed on hyperextension frames and are turned only by trained attendants. The form of extension used is left to the discretion of the surgeon. The author's preference is a plaster or celluloid bed. The duration of recumbency varies with each patient, and is governed by the progress of the case. On an average, in the acute state, it is one year. The process should be healed with good consolidation before the patient is allowed to get up. Although the conditions are not ideal, yet most of the cases may be kept out of doors all year round. The first exposure is short and only a small part of the body, generally the feet, are exposed for ten to fifteen minutes. Gradually the area and time are increased. Improvement is more marked after pigmentation has set in. To avoid relapses, the patient should have a month or two of sun treatment every summer for several years. Artificial heliotherapy by colored lights has not been successful. Complications are less with this treatment than with others. When a cold abscess is increasing in size or remains stationary very long, it may be aseptically punctured. A tight bandage should then be applied, and after 24 hours sun exposures should again be started. The abscess should not be injected. The diet should be mainly vegetarian.

Since tuberculosis of the spine is only a manifestation of a more or less general tuberculosis, the general treatment should take precedence over the local. The fixation operation for Pott's disease should occupy a very minor place. Only certain cases are suitable. Practically all cervical and lumbar cases, the very young children, and patients with abscesses are now excluded from such operations.—*Treatment of Tuberculosis of the Spine, G. I. Bauman, Cleveland M. J., October, 1917, xvi, No. 10, 657.*

Nephrectomy for Renal Tuberculosis.—The outcome of this operation must be viewed from the standpoint of the immediate mortality rate, the late mortality rate and the persistence of symptoms. The immediate mortality rate depends upon the condition of the patient at the time of the operation. The combined statistics of Drs. Bunts, Crile and Lower show a mortality rate for nephrectomy in cases of renal tuberculosis of 2.3 per cent, while a recent series of 100 consecutive nephrectomies done by Lower for various lesions showed but 1 per cent. The late mortality depends even more on the patient's condition and the technique of the operation. In the author's experience the rapidity with which the bladder symptoms clear up, depends on the duration of the symptoms preceding the operation. A very considerable per cent of these cases never clear up entirely. In an analysis of 87 consecutive nephrectomies for tuberculosis of the kidneys, 2 died within four weeks, one of shock and the other from a second tuberculous kidney. Ten cases died later, 2 of tuberculous peritonitis, 4 of pulmonary tuberculosis, and 4 from causes unknown. Regarding the persistence of symptoms, replies in 45 to 87 cases showed that half of those previously complaining of bladder symptoms, mainly frequent urination, still had some trouble but that all of these cases had had these symptoms for a long time preceding the operation. Twenty per cent reported perfect health, and all the rest were greatly improved.

Twelve of the 45 replies reported pain of a colicky nature in the back, and 25 reported pain of varying degrees in the back, side or

hip. Half of the series of 87 had had hematuria, and where the hemorrhage came from the kidney, it subsided, of course, after operation. The majority of cases with pyuria before operation had persistence of the condition.

Patients usually waited for eight months to three years before seeking surgical relief. Males and females were equally affected and 33 was the average age. Of the 87 cases only 18 reported tuberculosis in other members of the family, while 43 gave a negative report. In only 2 cases was the lesion proven bilateral, but autopsy reports show bilateral involvement in about two-thirds of all cases of tuberculous kidneys. In regard to the healing of the wound, about a third healed inside the first month, the majority taking one to three years, and a few even longer. Eight per cent were classed as improved.—*End Results of Nephrectomy for Renal Tuberculosis, W. E. Lower and J. P. Sharpe, Surg. Gyn. and Obst., November, 1917, xxv, No. 5, 522.*

Tonsillectomy in the Tuberculous.—The author found great difficulty in estimating the direct results of tonsillectomy on the tuberculous lesions for the following reasons: Some cases were well on toward recovery when the tonsils were removed. Here it is impossible to say that improvement would not have continued had the tonsils not been removed. Secondly, the lack of knowledge as to the patient's condition before the operation and the absence of accurate observation afterwards, and, thirdly, the impossibility of judging exactly what effect the operation has had on the tuberculous process. In operating upon consumptives certain precautions should be observed. The operation should be done when the general condition is favorable and the lungs relatively quiescent. Ether should be avoided whenever possible. It is the universal opinion that the patients get along much better afterwards. Laryngeal tuberculosis, unless actively spreading, is no contra-indication to operation, and is often times benefited by it. The presence of tubercle bacilli is also no contra-indication, but if the expectoration is copious, there is more danger of wound infection. Speaking as a whole, tonsillectomy in tuberculous patients is practically devoid of any danger, provided it is performed when there is no marked activity in the lungs.—*Tonsillectomy in the Tuberculous, F. L. Dennis, Laryngoscope, November, 1917, xxvii, No. 11, 805.*

Primary Tuberculosis of the Tonsils.—In recent years the tonsils have been regarded as the portal of entry for many diseases, but it does not appear that examination of tonsils after removal has yielded much information of value in regard to their supposed relationship to disease elsewhere. Mitchell, however, has recently published some interesting observations from Edinburgh on primary tuberculosis of the faucial tonsils obtained from children with tuberculosis of the upper cervical lymph nodes, and from children with enlarged tonsils only and without evidence of tuberculosis of the cervical glands or elsewhere. In the first group were 100 children and 6 adults. In no case was it possible to establish the presence of tuberculosis prior to removal and examination of the tonsils. The tonsils were rarely painful, and there were no symptoms except swelling of the upper cervical nodes, which in about one-fourth of the cases was slight and in the rest rather extensive. On microscopic examination 41, or 38 per cent, of the tonsils were definitely tuberculous. Animal inoculation in 92 cases gave 20 positive results, the bovine type of bacillus being isolated in 16. There were 100 cases, all in children, in the second group with enlarged tonsils only. The cervical glands were palpable in all. Microscopically 9 of these tonsils were tuberculous also, all 9 giving positive results on inoculation. The type of organism in 4 was bovine, in 2 human, and in 3 undetermined.

The tubercles in the tonsils were situated near the deeper portions of the crypts, and also directly beneath the surface mucosa as well as deep in the tonsil close to the capsule, the first two being the favorite locations. The position of the majority of the tuberculous foci in places within easy access of the oral cavity may be taken as suggesting infection by way of the mouth rather than by way of the blood or lymph by backward transport. The absence of any signs of pulmonary tuberculosis in such cases as these studied by Mitchell may be regarded as evidence that the lesions in the tonsils are primary and not the result of infection from the sputum, and also that the cervical lymph nodes are probably secondarily infected from the tonsils. The latter conclusion would point to the necessity of removal of the tonsils in operation for removal of tuberculous cervical lymph glands. The importance of the milk supply as a source of the infection in cases of tonsillar tuberculosis is emphasized by the fact that in many instances in the series under consideration the infecting organism was of the bovine type. Indeed, the results recorded by Mitchell, which are of special interest because of the large number of cases in which he found tuberculosis, should stimulate to other and even more extensive studies of

tonsils, removed for whatever reason, in order that their relation to tuberculous infection and possibly also to other conditions may be determined still more precisely than is the case at the present time.—*Editorial, J. Am. M. Ass., October 27, 1917, lxix, No. 17, 1436.*

1064 Tonsillectomies and Adenectomies.—The experience has been gained in private practice and in a London County Council school clinic. The followiug points are of interest to the tuberculosis worker. The strumous or scrofulous child, the child living in poor, dirty surroundings, present so often cases of enlarged tonsils and adenoids. Operations are usually successful when the hygienic surroundings admit of clean living. Otherwise failure in operations is courted. There are two types of enlargement of the upper deep cervical set of glands as the result of infection of the tonsils. The first is inflammatory, and accompanies most attacks of acute tonsillitis, and disappears with the tonsillitis. In repeated attacks of tonsillitis the enlargement, which is limited to the tonsil gland of the upper deep cervical group, becomes chronic, but gradually disappears with the tonsillitis, after the removal of the tonsils. The second type of enlargement if tuberculous is more marked, and there is extension to the other glands of the deep cervical group. If the case is early and the glands are not caseating, removal of the tonsils with suitable antituberculous treatment results in thelr disappearance, but the majority of hospital cases require removal of the glands in addition to the tonsils. The author has not seen and has no records of tuberculosis of the cervical lymphatic glands appearing after removal of the tonsils. In conclusion, when a child has a specific set of injurious symptoms which can be definitely attributed to the tonsils and adenoid growth, nothing but benefit results from removal, but there is a need for careful examination and selection of operation cases. An attempt should be made to ascertain and eliminate the cause of the condition under observation before the question of operation is finally settled.—*A Survey of 1064 Operations for the Complete Removal of Tonsils and Adenoids, E. D. Davis, Brit. M. J., January 26, 1918, i, No. 2978, 114.*

Diagnosis of Primary Tuberculosis of the Conjunctiva.—Although a rare morbid process, primary tuberculous conjunctivitis is met with from time to time and offers a special clinical type which is to be differentiated from the secondary type of the affection and lupus. The primary process is more commonly met with in children and young adults and usually only one eye is involved.

Primary tuberculosis and lupus of the conjunctiva are microscopically identical lesions, as both contain giant cells and the tubercle bacillus, but clinically it is important to differentiate them. Luc maintains that lupus never invades the conjunctiva primarily; a primary tuberculous ulcer, which is crateriform, is surrounded by yellowish miliary nodules. Lupus begins as a vegetative lesion and only loses its exuberance when it is about to end in a cicatricial process. Yellow points are never seen. The lupic ulcer cicatrizes spontaneously on its edges, while, on the contrary, the tuberculous ulcer extends from its borders. The usual site of lupus is on the free edge of the lid. Primary tuberculous lesions of the conjunctiva give rise to a marked purulent secretion and to involvement of the preauricular lymph node which is a constant phenomenon in the process. Nothing of the kind is met with in ocular lupus.

The differential diagnosis must be made between primary tuberculosis of the conjunctiva and epithelioma of this mucosa. In the former morbid process there is never any tumor, it being a surface lesion, and the ulcer is surrounded by miliary tubercles. The patient is more apt to be a child or young adult. In epithelioma, the lesion offers the aspect of a vegetating growth, which is ulcerated and which began on the skin and only invaded the conjunctiva secondarily. The patient is usually advanced in years, rarely a young adult, and never a child.

Syphilis produces conjunctival ulcers which are in some respects not unlike those of tuberculosis. The syphiltic type is anfractuous with irregular edges and is situated near the free border of the lid. It is a true loss of substance resulting from the breaking down of an initial sclerosis. The tuberculous variety is regularly crateriform, oval or round, more commonly seated on the tarsal conjunctiva and occasionally in the culs de sac.

Primary tuberculosis of the conjunctiva must not be mistaken for cerain luxurious forms of chronic trachoma; this will be avoided if one takes into account the lardaceous aspect of the mucosa, the presence of miliary tubercles, and the involvement of the preauricular lymph node. Actinomycosis should be mentioned as a possible mistake in diagnosis. The search for the yellow grains will affirm or deny the existence of this morbid process, which should only be thought of in exceptionally rare cases.

To avoid confusion with the affections

enumerated or with others of lesser importance, such as conjunctival polypi, and to make an undeniable scientific diagnosis, an extemporaneous biopsy should be made in every case where there is any suspicion as to the true nature of the conjunctival process. A portion of the piece of tissue removed should be examined microscopically, while the remainder is to be inoculated with all proper aseptic technic, into the anterior chamber of the eye or peritoneal cavity of a rabbit or guinea pig.—*Editorial, N. York M. J., January 19, 1918, cvii, No. 3, 128.*

Rosaceous Tuberculides of the Face.—A woman, thirty years old, had a reddish blue discoloration on cheeks and forehead which resembled rosacea. A small piece of skin from the forehead was excised and examined microscopically. Sections showed subepithelial masses of epitheliod cells in which giant cells were found. Author concludes from the histology and from positive tuberculin tests that the condition is of tuberculous origin. The differential diagnosis is briefly discussed.—*Ueber rosaceaaehnliche Tuberkulide des Gesichtes, F. Lewandowsky, Cor. Bl. f. Schweiz. Aerzte, September 29, 1917., xlvii, No. 39, 1280.*

Laryngeal Tuberculosis.—A routine examination of the larynx should be made in every case of pulmonary tuberculosis and in those suspicious cases where there are symptoms pointing to laryngeal involvement. Early diagnosis and rest treatment are the prerequisite to success here as in tuberculosis elsewhere. Every sanatorium should have a separate ward for laryngeal cases where deaf and dumb methods of communication should be in vogue or where patients should be made to communicate by paper and pencil. In early infection the chief signs to be looked for are localized inflammation or infiltration in the posterior commissure, arytenoids, or on the true vocal cords; less frequently on false cords, rarely on the epiglottis. As the case progresses either infiltration increases or necrosis takes place. About half the cases seen have had no subjective symptoms beyond those due to the lung condition and, consequently, would not have been discovered without routine laryngeal examination. Change in voice was present only when the true vocal cords were involved. The author obtained the best results by using argyrol in 20 per cent solution where the mucous membrane was not broken, and 2 per cent formalin where there was ulceration. The latter acts as an antiseptic and stimulates granulations, the former relieves congestion. Treatments are given two or three times a week. The mucus is first removed by washing with an alkaline solution and the medication applied on a cotton applicator. Any case of laryngeal tuberculosis having any reasonable chance of improvement as far as the lungs were concerned has show improvement; on the other hand, cases which seemed to offer good prospects of arrest as far as the lungs were concerned, but had no laryngeal treatment, invariably developed progressive laryngeal ulceration.—*Laryngeal Tuberculosis, H. F. Gammons, New England Med. Gazette, December, 1917, lii, No. 12, 657.*

Remarkable Cases of Polyserositis.—(1) A boy of sixteen is suffering for two weeks from cough, slight expectoration, fever, headache, slight precardial pain, occasional night-sweats, and a little dyspnea on exertion. The left apex showed high pitched breathing, increased voice and whisper. The heart was slightly enlarged, the sounds indistinct; double friction at the base. Pulse 120, regular. Fever was prolonged and fluctuated very much. The x-ray showed a pericardial and a right pleural effusion. One week after admission 800 cc. of amber colored serum were removed from the right pleura; specific gravity 1020; 291 cells to the cubic millimeter, all lymphocytes. The right pleura was tapped twice more. Twenty days later serum was removed from the left pleura but re-accumulated rapidly. The patient went home but returned after one month with dyspnea and swelling of the abdomen, moist râles over both lungs, large liver and spleen, movable dullness in the flanks. 2200 cc. of serum were removed from the abdomen; 300 cells to the cubic millimeter, 97 per cent mononuclear. From March till October the right pleura was tapped 5 times, the left 37 times, the abdomen 7 times. 31,025 cc. were removed from the pleurae, 20,750 cc. from the peritoneum; a total of 115 pounds. Gas was introduced into the left pleura 10 times, each time as much as fluid was removed. After the establishment of this artificial seropneumothorax the rate of accumulation of the effusion was much reduced. Tubercle bacilli had been found in the pleural fluid. The patient was lost sight of.

(2) A boy of nine who had had grippe and scarlet fever developed pericarditis and pleurisy, progressive weakness, dyspnea and abdominal distention, bronchovesicular breathing over both apices, râles over the right upper lung and both bases. Heart dullness enlarged; sounds distant; apex beat neither seen nor felt; liver and spleen enlarged. All serous sacs showed effusion. The serum contained 94 per cent mononu-

clears. From April till October the left pleura was tapped 16 times, the right 38 times, the abdomen 4 times. 28,150 cc. were removed from the pleurae, 4500 cc. from the peritoneum; in all 72 pounds. Gas was introduced into the right pleura 11 times, after which the rate of effusion decreased remarkably. The x-ray showed tuberculosis of the lungs. Pirquet and Moro positive. The patient diet five months later in a sanatorium. *Two Cases of Effusion in the Pleural, Pericardial and Peritoneal Cavities with Artificial Pneumothorax, W. R. Williams, Med. Clinics of North Am., i, No. 3, 627.*

Cardiovascular Lesions and Tuberculosis.—The authors give an account of examinations made by them at the training camp at Plattsburg, N. Y., with special reference to cardiovascular lesions and tuberculosis. One company of about 115 men was assigned as the daily task for the examination. There were usually a few men in excess who were carried on to the next day. The methods adopted are described by the writers. The pulse of the patient was taken while he was standing and before undressing, and then after he had stripped to the waist. The maximum heart impulse was determined and the boundaries of the heart outlined. The men were examined five at a time, after which they were made to exercise about half a minute and their hearts were carefully examined, and after that their lungs. About twenty minutes were occupied in examining each section of five men. At one time, on account of imperative orders to leave, a certain number of men had to be put under special strain and the examination could not be so thorough. Some of the men also could not be examined in the morning. From these experiences the writers conclude that a good day's work of an examiner would be a quota of forty-five men in the afternoon and thirty in the forenoon. For those held up for a further examination, special care was taken in recording and reporting all lesions in the heart and lungs. The recommendations of the writers are, from their experience, that not more than seventy-five nor less than sixty-five men should be examined in one day and the holdups be examined later in the day. It should not take more than fifteen or twenty minutes to examine each section of five men. The holding up of a man for further examination does not mean his disqualification, but is only for the purpose of adequately studying the case about which a question has arisen. The holdups resolve themselves into two groups: those that had to be written up and those that could be readily passed. Of the latter the great majority have rapid pulses. There is a wide variation of rate, according to the time of day and the character of the military exercises or drills to which the men have been subjected previous to the examination. The pulses are slower as a rule in the morning, but in the afternoon they are apt to go up to between 84 and 100 and many even higher. The factor of nervousness is also to be considered, though this plays a minor rôle as a rule. In these cases a little rest generally brought the pulse down. In one exceptional case, this was not true, but the man was passed because no definite defect could be found. A good many murmurs were discovered, systolic in time, in the pulmonary area and in the third and fourth interspaces to the left of the sternum. These murmurs are striking, but not of particular significance in the absence of enlargement of the heart and accentuations. They are not infrequent in long chested types in early adult life. A number of men develop after exercise a functional systolic murmur at the apex, transmitted into the axilla. Their hearts, however, were normal and their response to exercise was good. In a number of cases the maximum impulse of the heart was in the sixth interspace when the patients were standing and inside the nipple line and normal in character without enlargement of the heart. There was one very interesting case of total bradycardia. There was one case of idiopathic dextrocardia and several cases of moderate hypertrophy in athletes without valvular lesion. A number of cases were temporarily held up on account of colds and râles in the chest. Acute bronchitis was prevalent, indeed almost universal, in the early weeks of the camp and included the examiners. The differentiation, however, between bronchitis râles and tuberculosis offers no great difficulty. There were the usual findings of atelectatic râles at the apexes and so-called marginal râles at the bases in front; but, unless the rales were unduly persistent, the patients were not held up. In regard to organic cardiovascular lesions and the causes of disqualification they refer to the individual histories, of which a number are given, but cannot, of course, be briefly abstracted. Of the total number examined, 584 in all, 582 were passed, one was disqualified, one was recommended for special service and two were passed in spite of the organic lesions. The percentage of organic cardiovascular lesions among the candidates for reserve officers was 0.255, while among the enlisted men of the Regular Army it was 0.34. The tuberculosis average was much higher among the regulars than among the

candidates. The authors point out that the candidates examined were of a type not often seen by tuberculosis examiners, and their lesions were of the kind that are usually overlooked. They were not early and incipient cases, but they belong to the large class of persons (too large) for whom previous examination has been made too superficially. There can be no doubt that in every case the lesions represented an earlier childhood infection which failed to become acutely active. It seems likely that the fine dry râles in coughing are caused by intensive training and hard living.—*Cardiovascular Lesions and Tuberculosis: Methods and Results of Examinations by the Cardiovascular and Tuberculosis Commission at the Second Plattsburgh Training Camp for Reserve Officers, A. P. Francine, J. W. Price and F. B. Trudeau, J. Am. M. Ass., December 22, 1917, lxix, No. 25, 2110.*

Internal Secretions and Tuberculosis.—The ductless glands, pancreas, adrenals, thyroid, parathyroid, and thymus, all work in harmony both in the process of metabolism and in defense. On the whole the relationship to tuberculosis is mainly concerned with the defense of the body against infection. Continuous defensive stimulation of the glands such as that provoked by repeated exposure tends to enhance the autoprotective efficiency of the body. Concerning the relationship of the other endocrinic glands to tuberculosis little is known and no direct connection can be established.

Derangement in the ductless glands predisposes to the development of tuberculosis. Through pancreatic insufficiency and adrenal derangement one of the most marked of the early symptoms in tuberculosis is produced, namely, loss of strength or neurasthenia. Another symptom, indigestion, is also referable to the pancreas. As result of pancreatic and adrenal deficiency, the main barriers to infection, the intestinal and alveolar, are more or less unable to carry on their defensive functions due to lack of defensive ferments. The low blood pressure observed in tuberculosis is also referable to adrenal insufficiency. Furthermore any adrenal derangement by reducing the supply of secretion to the right heart, impairs its contractile power and therefore, its ability to distribute adequately the venous blood throughout the lungs for proper oxygenation. These qualitattive and quantitative deficiencies in the blood are most effectively felt in the pulmonary apices, the seats of the earliest tuberculous lesion. Besides through the loss of the defensive power of the adrenal secretion the vulnerability to infection is increased. Adrenal stigmata are very common in tuberculosis.

Atrophy of the thyroid is a prominent feature in tuberculosis, and is commonly observed in persons predisposed to the disease. The protective rôle of the thyroid is due to its iodine content. The thyroid, and more especially, the parathyroid, sensitize the bacteria and render them vulnerable to the digestive action of the ferments in the tissue and in the phagocytes, including those in the pulmonary alveoli. Furthermore the parathyroid by promoting the formation of calcium phosphate takes part in the curative processes in tuberculosis.

The relation of the thymus to tuberculosis is evident when through impairment of its functional integrity the osseous development of the child is inhibited. His bones yield readily to infection.

Various symptoms, as loss of strength, emaciation, low blood pressure, etc., attributed to tuberculosis, are but due to pluriglandular insufficiency. However, the prevailing custom of awaitiug a diagnosis of tuberculosis to inaugurate active treatment is one of the most active factors in the perpetuation.

In the military service the constant stress cannot but undermine the efficiency of the ductless glands. This means that such men are vulnerable to infection. Vulnerability here can be greatly reduced by shortening the period of service in the trenches. A careful search for stigmata of endocrinic insufficiency should form part of the examination of recruits. Organotherapy in the protection of subjects showing the stigmata which indicate vulnerability to infection, particularly to tuberculosis, is a valuable addition in the prophylaxis.—*The Internal Secretions as Related to Tuberculosis in Civil and Military Practice, C. DeM. Sajous, N. York, M. J., September 1, 1917, cvi, No. 9, 389.*

Tuberculosis and Asthma.—Tuberculosis is not dependent upon asthma, whereas it is a common contributing factor to asthma. Chronic bronchitis is sure to be complicated with involvement of the pulmonary tissue. The bronchitis may exist because of the tuberculosis; or the tuberculosis implants itself in the fertile soil produced by the organisms of the bronchitis. A large percentage of asthmatics have previously had chronic bronchitis. Hence the likelihood of asthmatics either having tuberculosis or of their becoming tuberculous is very great. The above observations led the author to the statement that most asthmatics are tuberculous in a minor degree, or are fit subjects for tuberculosis.—*Tuberculosis and*

Asthma, O. H. Brown, Southwest. Med., November, 1917, i, No. 11, 31.

Tuberculosis and La Grippe.—Of 120 patients with pulmonary tuberculosis, 23 contracted the respiratory infection prevailing epidemically in Denver during the past winter. In 17 of these cases, who were moderately and far advanced, there resulted an extension of the tuberculous process. Four patients developed an albuminuria with granular casts which did not exist before the onset of the respiratory infection. One of these cases came to a fatal end with suppression of urine. One case with a severe simple laryngitis now shows tuberculosis of the larynx. A study of these cases has shown that in pulmonary tuberculosis la grippe may prove a fatal complication by establishing in the lungs an ineradicable secondary infection, by the infliction of tuberculous laryngitis, or by causing the collapse of an already overburdeced heart or kidneys.—*Relation of the Recent Epidemic of Respiratory Diseases in Denver to Pulmonary Tuberculosis, J. J. Waring, Am. J. M. Sc., September, 1917, cliv, No. 3, 371.*

Bronchopneumonia Following Pulmonary Hemorrhage.—Among 1000 odd cases admitted to the sanatorium in the last ten years, only one case of bronchopneumonia following hemoptysis has been recorded, while there have been many hundreds of cases of pulmonary hemorrhage. A woman, aged twenty-seven, was admitted September 30, 1916 with signs of active disease in the right apex in front, and at the right base behind. The patient appeared to improve and was doing walks of 2 miles daily with satisfactory temperatures, Toward the end of January, 1917, however. there were a few small hemorrhages. Despite prolonged rest in bed there was further bleeding from the lungs. Many times her condition seemed imcompatible with life, but each time she improved again. Between May 1 and 14 the patient seemed better, the color had improved, and she was able to take nourishment more freely. May 14, the temperature began to swing more during the twenty-four hours, cough returned, and there was much tenacious expectoration, which was expelled with difficulty. Sweating was profuse. On May 23 she became more cyanosed, later unconscious, and died with signs of asphyxia. At the commencement of the rise of temperature a hasty examination showed signs of consolidation over the back of the right lung, where there was bronchial breathing, and the same condition was present in the left apical region. Later in the course of the case the bronchial breathing over the right back gave place to loud tubular breathing and coarse crepitations, and these extended around to the base in front. Treatment throughout the case was symptomatic. The points of interest seem to be: (1) the length of time (thirty-four days) the patient survived the onset of the bronchopneumonia; (2) the fact that morphin was not given to check the hemorrhage that apparently caused the complication, and could not, therefore, have been a factor. It was thought unwise to administer morphin on account of the violent vomiting caused on a previous occasion; (3) the three stages into which the course of the illness can be divided: (a) the first eleven days when the case conformed to the text-book description of a case of aspiration pneumonia, with continuous temperature, cyanosis, rapid respirations and pulse, absence of cough and sputum and no return of hemorrhage; (b) the next twelve days, during which the patient felt much better; (c) the last eleven days, when cough and sputum returned, sweating was profuse, the temperature became remittent in type, and the signs and symptoms suggested rapidly breaking down lung with cavity formation.—*Bronchopneumonia Following Pulmonary Hemorrhage, C. G. Reinhardt-Goodwin, Practit., September, 1917, xcix, No. 3, 288.*

Unresolved Pneumonias.—Hess emphasizes the fact that tuberculosis is frequently a complicating, if not primary factor in many of the fatal cases and unquestionably frequently a factor in delayed resolution in recovered cases. Empyema especially of the intralobular type must be excluded in all cases. Empyema and tuberculosis are the two complications to be most carefully watched for and treated, the former surgically, the latter symptomatically. The rare etiologic factors, such as syphilis, foreign body, metastatic and primary newgrowths, while uncommon, must not be overlooked. The diagnosis of nontuberculous interstitial pneumonia should always be made with great caution and after exclusion of all other conditions causing similar physical findings.—*Unresolved Pneumonias; What Becomes of Them? J. H. Hess, Arch. of Ped. September, 1917, xxxiv. No. 9, 686.*

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* "The Choice of Tuberculins," by Benjamin White, Otisville, N. Y., Department of Health, City of New York. Read at the annual meeting of the Medical Society of the State of New York, at Saratoga Springs, May 18, 1916.

† Human or bovine type.

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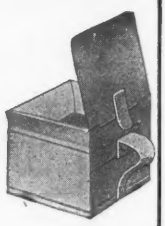

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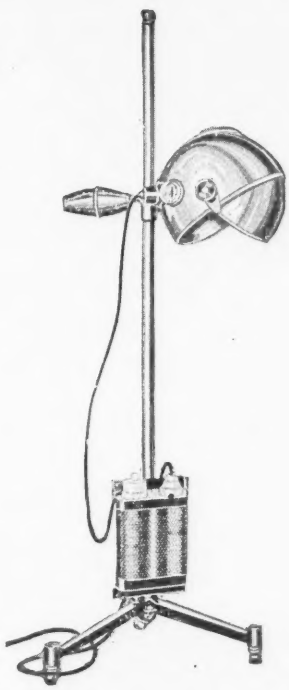

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